

ACTA DERMATO-VENEREOLOGICA
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HAND ECZEMA
AND OTHER HAND DERMATOSES
IN SOUTH SWEDEN

BY
GUN AGRUP

LUND 1969



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AKADEMISK AVHANDLING

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FROM THE DEPARTMENT OF DERMATOLOGY, UNIVERSITY OF LUND, SWEDEN

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INTRODUCTION

Prevalence studies have demonstrated that diseases of the skin are common (Lomholt 1963, Hellgren 1967). In a recent review from USA prevalence rates for dermatological diagnoses were: 6.4 % among insurance claims, 3.6 % among discharge diagnoses of hospitalized patients, 5 % of ambulatory patients to clinic facilities in civilian life and 6.6 % in military—in Vietnam 10.5 % (Baer and Johnson 1968).

Hand dermatosis is one of the largest and most important groups of dermatoses seen in general and dermatological practice (Lane et al. 1945, Sulzberger and Baer 1949, Sutton and Ayres 1953, Tomlinson 1957, Flood 1963, Bleeker 1967). At the Department of Dermatology, University Hospital, Lund, hand dermatoses have long constituted a large diagnostic group. Of 4633 patients examined at the department in 1965 for the first time because of skin diseases, 34 % had hand dermatoses and of these, more than half had hand eczema.

Old and new statistics have consistently shown that dermatoses are the most frequent occupational diseases (Birmingham 1968). Hand dermatoses constitute a large proportion of occupational dermatologic diseases. An investigation of 2272 persons with occupational dermatoses from Milano by Meneghini, Rantuccio and Riboldi (1963) revealed that the primary sites of the disorder were the hands in as many as 87 % of the patients.

All occupational dermatoses and many hand dermatoses are definitely due to environmental factors. Investigations of these factors are necessary for a correct diagnosis and rational treatment of all forms of hand eczema and are of decisive importance also in the management of other hand dermatoses.

This report deals with the problems bearing on hand dermatoses in South Sweden with special emphasis on eczema of the hands.

MATERIAL AND METHODS

THE GENERAL HEALTH SURVEY IN THE COUNTY OF MALMÖHUS

One hazard of disease-oriented research is that the patients available for investigation are not representative of the occurrence of the disease to be studied. To avoid this error, the investigation was carried out on a fairly unselected population.

Since 1946 general health surveys including mass chest X-ray have been carried out regularly in Sweden. In some counties these mass health surveys have included X-ray examination of the heart, sometimes also urinalysis for proteinuria and glycosuria.

From 1962 to 1965 an extensive general health survey was made in Malmöhus läns landsting (county of Malmöhus excluding the town of Malmö). The county is situated in the south of Sweden. The total population of the county was 398,816 in January 1962 and 411,351 in January 1966. Only inhabitants above 10 years of age were included in the health survey. All together 346,819 persons were invited to take part. The examination included: mass X-ray examination of the lungs and heart, measurement of height and weight, examination for proteinuria and glycosuria and, during part of this period, also bacteriuria. The part of the survey carried out between January 1964 and June 1965 was extended to include examination for hand dermatoses. During that period 107,206 persons living in 22 communities, including 15 rural communities, 3 larger communities, and 4 towns (Landskrona, Ystad, Hälsingborg and Eslöv) were examined.

The geographical area studied

The county of Malmöhus (Fig. 1) has an area of 4752 km² and at the time of the health survey it comprised 70 communities (the town of Malmö excluded) 53 of which were rural communities, 9 larger communities and 8 towns. Of the population of the county, 50 % lived in towns. The main industries are ship-building and other heavy industries, construction, rubber and plastic industries, cement factories, brickworks, food, pharmaceutical, packaging and lithographic industries. There are also some factories for ready-made clothing. The county comprises large agricultural areas including market gardening.

The town of Lund is situated 55° 43' N and 13° 12' E. Average temperatures



Fig. 1. County of Malmöhus in South Sweden. Scale 1 : 1,500,000.

Table 1. *Climate in Lund*

	Average temperature (C°)	Relative humidity (%)		Average rainfall (mm)	Sunshine (hours)
		7 a.m.	1 p.m.		
January	-0.8	87	85	48	27
February	-1.0	89	80	34	68
March	1.3	88	79	27	61
April	5.9	91	73	33	106
May	11.0	84	60	39	229
June	14.9	83	60	51	210
July	17.2	86	60	77	234
August	16.6	90	63	72	183
September	13.2	90	66	58	136
October	8.6	90	75	57	74
November	4.9	88	83	44	32
December	1.7	86	86	44	11

and rainfall (1931-1960) are listed in Table 1, which also gives information on hours of sunshine and relative humidity (1966).

Health insurance rules and regulations

All people living in Sweden are health insured (Allmän försäkring 1966). The main benefits are: Daily allowance during sick-leave for all persons between 16 and 67 years. The allowance varies with earned income. Housewives are granted a basic daily allowance. Of physicians' fees, 75 % is as a rule refunded. Medicine is available at a reduced price if prescribed by a physician. Free hospital treatment of all in-patients. Travelling fees are mainly refunded if the patient is referred to a specialist by another physician. All persons in the employ of public authorities or private companies are insured against occupational injury and disease. For occupational diseases special benefits are granted after 3 months' disease. The benefits are: free medical care, free medicine and free journeys to the physician. In the event of partial or complete disability a life annuity is granted.

Medical facilities

The county of Malmöhus (the town of Malmö excluded) has 6 hospitals including one in Lund with a department of dermatology. 3 dermatologists in private practice and 22 medical county officers were working in the county at the time of the present investigation.

Administration

The general health survey was carried out by the county council in cooperation with the National Board of Health, Mass X-ray Centre. The investigation was organized by a central committee appointed by the county council, Lund. A local committee was appointed in every community before the beginning of the survey. These committees included representatives of the Board of Health, representatives of the community, and representatives of various organizations such as sport clubs, political parties and religious organizations. The members of the local committee and persons partaking in the health survey were informed that all information about the patients was to be kept secret.

The local committees appointed their own directors, who were responsible for the local organization of office work and home visits. The work of the local committee consisted in organizing the examinations in the respective areas and furnishing the people there with adequate information about the survey. The public were informed by posters and by notices placed in the entrance halls of apartment houses. Folders were distributed by mail or in association with personal visits. Attempts were made to meet all of those entitled to examination personally. When visited by one of the persons of the team the members of the

Table 2. *Response rate at a general health survey in 22 investigated communities in the county of Malmöhus*

age, years	invited	attended	
		number	%
10-19	24,615	22,242	90
20-29	20,924	14,299	68
30-39	19,354	16,060	83
40-49	22,451	18,835	84
50-59	22,511	17,894	79
60-69	17,318	11,950	69
70-79	10,198	5,039	49
80-89	3,701	858	23
90-	372	29	8
total	141,444	107,206	76

family in question were given a written invitation and a questionnaire. An appointment for the examination was made and help was offered with the filling in of the questionnaires, if so desired. If a person did not keep his appointment for the examination, he was again contacted by phone, by post or by a personal visit and offered a new appointment.

The examination team consisted of personnel with equipment from the Board of Health, Mass X-ray Centre and persons appointed by the communities to do clerical work and to help those who were to be examined. The investigation was carried out in public buildings such as schools, athletic centres and civic centres, and sometimes at the places of employment during working hours.

School children above 10 years of age were examined classwise with their teacher. Housewives were allowed to take their children with them and, if they wished, also have their children under 10 years of age examined. Such young children are, however, not included in the present investigation. The X-ray personnel were not allowed to work more than 6 hours a day. It was intended that each team should examine 300 persons a day, *i.e.* 50 persons per hour. The appointments for the examination were made at such times as to interfere as little as possible with the work of the people to be examined. The survey was therefore carried out partly in the evening.

Response rate

Of those entitled to take part in the investigation, *i.e.* persons above 10 years and living in the communities in question, 76 % attended. The attendance varied widely with age (Table 2). It was high (90 %) in the 10-19 year class because of school examination. It was lower (68 %) for the 20-29 year class. The attendance then increased somewhat between 30 and 60 years, after

which it declined. Also in other investigations the attendance rate has tended to fall in the higher age classes, and in some the attendance of persons round 20 years has been low (Frisk et al. 1957, Hellgren 1967, Bjerre et al. 1969).

The sex distribution in the present investigation was almost equal (males 49 %, females 51 %), i.e. the same distribution as for the population of the county of Malmöhus.

DERMATOLOGIC EXAMINATION

Examination routine

The families visited in their homes for information were given invitation cards which also served as identification cards. They took the cards with them to the investigation. The card contained a question: *have you any skin changes on the hands (apart from common warts)?* ☐ yes ☐ no. On arrival at the examination room it was always checked whether this question had been answered.

The health survey was free of charge, as was the clinical examination that might be indicated by positive or suspected positive findings. Such clinical examinations were carried out at the University Hospital, Lund. Those who answered in the affirmative to the question as to skin changes on the hands, were offered a free examination at the Department of Dermatology, Lund, and received a questionnaire.

One of the offices of the out-patient department was reserved for the examinations. As a rule, 8 first examinations per day were performed 5 days a week. The examinations were performed in the mornings and the appointments were made so that persons arriving by train or bus did not have to wait. Most persons visited the department twice. Re-visits, e.g. for the purpose of reading the patch tests, were carried out both in the morning and in the afternoon.

The answers given in the questionnaires were discussed with the participants. They were questioned concerning the duration and site of the skin disease, any atopic dermatitis in childhood, previous medical treatment, sick-leave, occupation and any change of occupation. If the questionnaires had not been properly filled in, the participants were allowed to enter supplementary information before the examination. The examination invariably included inspection of the hands and feet and often of the entire body, i.e. in the event of eczema. The persons' histories were taken down and entered into conventional hospital records as well as into a special protocol. Information considered of relevance was codified for automatic data processing before the investigation was started.

Suspected contact allergy was indication for epicutaneous patch testing. Epicutaneous tests were also performed on those persons whose history clearly revealed contact allergy. The tests were carried out with compounds routinely used at the department and with substances to which the persons were exposed in their occupation and leisure time. Microscopy for mycelia in the skin and

nails was always performed if there was reason to suspect dermatophytosis. Occasionally the examination included bacteriological studies, determination of the E.S.R., Hb and differential blood count. Biopsy was done only if thought necessary, it being feared that too liberal a use of the procedure might cause too many people to refrain from taking part in the survey.

All patients with hand dermatoses were treated at the examination if treatment was considered beneficial. If prolonged or special care was necessary, the patients were referred to other physicians.

Diagnoses

Previous diagnoses and present diagnoses were recorded. If previous and present diagnoses appeared to be identical, both were recorded if at least one year had elapsed between the two diagnoses. The skin changes for which an affirmative answer had been noted were regarded as the *main diagnosis*. Conditions discovered by inquiry into the patients' histories and other skin diseases detected at the examination were recorded as *supplementary diagnoses*.

The *criteria* used for most of the diagnoses were in accordance with those given in general dermatological and dermatopathological textbooks (Lomholt 1948, Ormsby and Montgomery 1948, Sutton 1956, Lever 1961, Hellerström 1962, Pillsbury, Shelley and Kligman 1962, Andrews and Domonkos 1963). Here definitions and diagnostic criteria are given for those conditions on which opinions differ concerning their diagnoses and characteristics.

Eczema and *dermatitis* were used as synonyms.

Acrovesiculatio recidivans (Simons). Synonyms: dyshidrosis (Fox), cheiropompholyx (Hutchinson), pompholyx. Definition according to Sulzberger and Baer (1949) and Simons (1962): The common clinical lesions are deep-seated small vesicles, often symmetrically located on the palms and along the sides of the fingers. Sometimes these vesicles form groups and more or less circumscribed clusters. Erythema occurs only when the vesicles are eroded. Recurrences and exacerbations are especially likely to occur in the spring and summer.

Pustulosis palmaris et plantaris (Lever). A persistent eruption of pustules occurring predominantly on the thenar and hypothenar eminences and the sole or sides of the heel. The skin of the affected areas is shiny, reddened and pustules leave behind brownish patches. Typical psoriatic lesions and history of psoriasis was absent.

Dermatophytosis. This diagnosis required demonstration of dermatophytes by microscopic examination of potassium hydroxide preparations or by culture. Direct microscopy was done if the palms or the volar aspects of the fingers were dry, reddened, scaly or hyperkeratotic.

Mycids. Criteria according to Sulzberger and Baer (1949): A demonstrable focus of primary fungous infection on the feet or elsewhere. Onset of the erup-

tion on the hands should follow activation or irritation of the primary focus. The eruption on the hands should be symmetrically distributed and located especially on the thenar and hypothenar eminences, the palms and the sides of the fingers. The eruption on the hands should subside within a reasonable period after the primary focus of fungous infection has been cleared up or at least brought under control.

Allergic contact dermatitis. Dermatitis with a varying degree of reddening, papules, vesicles, infiltration, lichenification and fissures. The diagnosis requires a history of exposure to an allergen related to the time and site of the patient's eczema. Exposure to the allergen is regarded as the most important cause of the dermatitis.

Traumiterative dermatitis (Hagerman): traum-iterative dermatitis, *i.e.* dermatitis due to iterated traumatization. Synonyms: primary irritant dermatitis, toxic contact dermatitis. Dryness and cracks of the skin are followed by dermatitis with a varying degree of reddening, papules, vesicles, scaling, lichenification and fissures. Vesicles are usually less common and fissures more common than in allergic contact dermatitis. It is often morphologically not distinguishable from allergic contact dermatitis. It is confined to the areas repeatedly exposed to chemical and/or physical trauma. No eczematogenous exposure to allergens that may have produced positive reaction.

Atopic dermatitis. Dry, lichenified, itching dermatitis with lesions often showing signs of severe scratching. The changes are often well defined and multiple on the dorsum of the hands in persons who have previously had atopic dermatitis or who still have symptoms of it elsewhere on the body. If characteristic atopic dermatitis had not previously occurred and if no signs of atopic dermatitis were seen elsewhere at the examination, the hand changes were not classified as atopic dermatitis. If allergic or traumiterative contact eczema was combined with atopic dermatitis also on the hands, the condition was diagnosed as contact dermatitis.

Nummular eczema. Isolated, papular or papulovesicular foci forming coin-sized often round or oval foci with a tendency to peripheral spread and central healing. Recurrences are apt to occur, and often the new elements appear first in the almost healed centre of the coin-shaped lesions. The changes are usually localized to the backs of the hands, to the extensor sides of the lower arms and legs. They tend to ooze and become crusted at an early stage of their development and are often worse in winter.

A "dry" variant of nummular eczema has been described by Dowling (Calnan and Meara 1956). Large, round plaque with widespread changes on the outer aspect of the limbs and the trunk and microvesicles in the palms of the hands and the soles of the feet. This type of nummular eczema runs a long course and does not show typical seasonal variations. Tissue from such lesions was examined microscopically and by culture to exclude dermatophytosis.

Unclassified dermatitis. Dermatitis of varying severity with one or more of the following changes: reddening, oedema, papules, scaling, fissures, lichenifica-

tion and exudation. The history and the examination of the patient's skin do not allow assignment of the condition to any of the other eczema groups.

Circumscribed palmar keratoderma. Synonym: hyperkeratotic dermatitis of the palms (Sutton). Volar, often bilateral and symmetric changes of the skin, thickened and often cracked skin, often centrally in the palms of the hands. The changes are usually well outlined. Keratosis and fissures are more pronounced than in fungal infections. Infections with dermatophytes must be excluded. Some patients have less distinctly outlined keratoses on plantar surfaces, especially on the heels. Itching, if any, is only moderate.

Circumscribed neurodermatitis. Circumscribed lichenification with itching. At times the eruption is decidedly papular, in other instances the patches are excoriated and slightly scaly.

Psoriasis. If situated on the backs of the hands or fingers there are reddened, fairly well defined changes with slight infiltration and scaling of stearine type, but often less pronounced than on the trunk and proximal parts of the limbs.

The lesions on the palms may be reddened, infiltrated, scaling, often fissured, diffusely outlined changes or persistent volar eruption of pustules. The diagnosis requires characteristic psoriasis also elsewhere and a negative result of examination for dermatophytes.

Senile lentigo. Well-defined, brown maculae with little or no infiltration, varying size and often only a few millimetres in diameter. The lesions are multiple and situated on the backs of the hands in middle aged and elderly persons.

Occupational dermatosis. The medical definition according to the Committee on Occupational Dermatoses of the American Medical Association (Lane et al. 1942). "A pathological condition of the skin for which occupational exposure can be shown to be a major causal or contributory factor." In the present work the expression *is considered* is preferred to *can be shown* in the preceding sentence.

Housewives' dermatosis. A pathological condition of the skin for which the patient's own housework is considered to be a major causal or contributory factor.

Occupations

Occupations were codified as listed: building work, bricklayers and masons, cement industry, electrotechnical industry, package industry, unskilled labour, pharmaceutical and chemical industry, photography, civil servants and free professions, hairdressing, fishing, glass and ceramic industries, graphic industry, mining industry, rubber industry, hotel and restaurant branch, shop and warehouse work, house cleaning (charwomen and caretakers), agriculture, bakers and pastrycooks, office work, laboratory work, food industry, leather industry, leather dying industry, metal industries, armed forces, painting and decorating, paper mills, plastics industry, furriers, fur dying, nursing and medicine, cleaning (hospital), shoe- and clog-makers, forestry (woodmill), chimney-sweeps, ser-

Table 3. Test substances, concentrations and vehicles used in the standard series. All concentrations are given as w/v except for the last two which are given as w/w. Substances in italics were used also at the after-examination.

test substance	%	vehicle
<i>potassium bichromate</i>	0.3	water
<i>cobalt chloride</i>	2.4	water
<i>nickel sulfate</i>	5.4	water
<i>balsam of Peru</i>	25	methyl-ethyl-ketone (MEK)
<i>p</i> -phenylenediamine	2.2	ethanol
<i>p</i> -aminoazobenzene	0.9	MEK
epoxy resins (Ferroclere, Araldit)	1 each	MEK
formaldehyde ¹	3	water
phenol formaldehyde resin ²	10	ethanol
carbamide formaldehyde resin	30	ethanol
diethylstilbestrol ³	2	ethanol
cinnamon (oil of cinn. zeilonici, oil of cinn. cassie)	2.5 each	peanut oil
<i>p,p'</i> -diaminodiphenylmethane ⁴	2	MEK
mercaptobenzothiazole	1.6	MEK
tetramethylthiuramdisulfide and dipentamethylenethiuramdisulfide	2.4 each	MEK
balsam of pine and spruce	15 each	MEK
wood tars (tars of pine, beech, birch and juniper)	5 each	MEK
coal tar	5	MEK
colophony	5	MEK
neomycin sulfate	20	petrolatum
hydroxyquinolines ⁵	3 each	petrolatum

¹ On the first examination 295 persons were tested with 2 % solution of formaldehyde. This concentration was used throughout the second testing.

² 295 persons were tested with 5 % phenol formaldehyde resin.

³ On the first examination 191 persons were tested with a mixture of 1 % diethylstilbestrol and 1 % bisphenol A.

⁴ On the first examination 521 persons were tested with a mixture of 2 % diaminodiphenylmethane and 1.8 % benzidine.

⁵ 5,7-dichloro-2-methyl-8-hydroxyquinoline (Sterosan®), 7-iodo-5-chloro-8-hydroxyquinoline (Vioform®), 5,7-diiodo-8-hydroxyquinoline (Enterosept®) and 5-chloro-8-hydroxyquinoline.

vice, stone and brickworks, textile industry, textile dying, plant and flower nurseries, carpentry, communications, sewage, road workers, musicians, book-binding, other industries, other trades, pensioners, students, no occupation.

Patch testing

All tested patients were tested with the substances in Table 3. The substances in Table 4, on the other hand, were used on a varying number of patients. It is evident from Table 4 that the substances and the solvents used varied. This was due to changes in the routine procedure of the test laboratory at our department, at which all tests were performed. In order to avoid errors at the test laboratory the routine test method used there was also applied in this investiga-

Table 4. *Test substances, concentrations and vehicles*

test substance	%	vehicle
turpentine, Swedish (different brands)	10, 15	peanut oil
N,N'-diphenyl-p-phenylenediamine and N-phenyl-N'-cyclohexyl-p-phenylenediamine	2.6 each	MEK
N,N'-diphenyl-p-phenylenediamine	2.6	MEK
N-phenyl-N'-cyclohexyl-p-phenylenediamine	2.6	pentoxol
phenyl- β -naftylamine	2.2	MEK
diphenyl-guanidine	2.1, 1	ethanol
sodium-dimethyl-dithiocarbamate	1	water
lanolin	with 5 % salicylic acid	
esters of p-hydroxybenzoic acid:	5 each	MEK or petrolatum
ethyl paraben		
methyl paraben		
propyl paraben		
benzocaine	5, 1.5	ethanol
topical medicaments		as is
hand lotions and creams		as is
balsams and essential oils:		
balsam of Tolu		
benzoin	4.5 each	MEK
oil of citronella		
oil of clove		
oil of eucalyptus		
oil of pelargonium		
oil of peppermint	1 each	MEK
pyrethrum flowers, extract of	25, 15	MEK
plants (a piece of leaf or flower)		as is
Primula obconica, ether extract of		
orange peel	25	petrolatum
perfumes, mixtures of	1 each	ethanol
polish	5	MEK
benzalkonium chloride	0.1	water
benzethonium chloride	0.1	water
cetyl pyridinium chloride	0.1	water
mercury, metal	1, 5, 20	petrolatum
glycols:		
1. propylene glycol		
ethylene glycol		
hexylene glycol	33 each	
2. propylene glycol		
ethylene glycol		
hexylene glycol	10 each	ethanol
propylene glycol	5	ethanol
stearyl amines:		
lauryldimethyl amine		
olein amine	0.25 each	ethanol
detergents (3 different brands: Jör, Surf, Radion)	1.7 each	water
benzyl alcohol and benzaldehyde	3 each	ethanol
hydrazine hydrate	1	water

Table 4 cont.

test substance	%	vehicle
glove-cleanser	5	water
2,2'-dihydroxy 5,5'-dichloro-diphenylmethane	1	ethanol
p-toluenediamine	2	water
p-toluidine	2.2	MEK
bacitracin	20	petrolatum
soap	5	water
bisphenol A	2	ethanol
bisphenol A and benzestrol	1 each	MEK
hexamethylenetetramine	1.4	water
hexachlorophene	5	ethanol
tween 80 and span 80	5 each	ethanol

tion. The number of tests with many substances varied because testing with these substances was done only when indicated by the patient's history.

All the patches were placed on the back. The Al-test¹ units were used (Magnusson and Hersle 1965). This test unit does not produce any irritation of the skin. Leukoplast^{®2} was used as an adhesive. In persons known to be sensitive to adhesive (11 %), Dermicel^{®3}, which is less occlusive (Magnusson and Hersle 1966), was used.

Intracutaneous tests with metal solutions and double epicutaneous tests with 10 substances were done because of 2 special investigations in progress at the testing laboratory, one on intracutaneous reactions to metals (Fregert and Rorsman 1966) and the other on standardization of routine patch test technique (The Scandinavian Committee for Standardization of Routine Patch Test, Magnusson et al. 1966).

The test patches were applied 48 hours on the back and the results were read, as a rule, on the third day, occasionally on the second or fourth day. The reaction was considered positive when erythema and infiltration or papules or vesicles occurred. Erythema alone was not accepted as a positive reaction.

Data registration and processing including statistical analysis

The data obtained from persons invited to the general health survey were processed at Malmöhus läns landsting with the computer IBM 360/20.

For treatment of the data obtained from questionnaires and at examinations punch cards were used. The data were processed at the computer centre at Lund University with the computer SMIL and with the computer at Uppsala University (C D 3600).

Statistical calculations were made according to Maxwell (1964): chi-square test, chi-square test for trend, and test for binomial distribution.

¹ IMECO (Astra Agency Co.) AB, Stockholm, Sweden.

² Beiersdorf, Hamburg, West-Germany.

³ Johnson & Johnson, New Brunswick, N.J., USA.

RESULTS

FIELD STUDIES

Field studies were performed to assess the reliability of the "yes" and "no" answers by the patients in answer to the question of the hand dermatoses.

On 14 different occasions in 7 communities the hands of all 1819 participants were examined. Warts were the commonest changes, which most of the patients had diagnosed themselves. 3.8 % of the persons examined were found to have verrucae vulgares of the hands. It would thus appear that of the 107,206 persons included in this investigation, about 4000 over 10 years of age had viral warts on their hands. 33 persons, 20 males and 13 females, reported other skin lesions on the hands. Of these, 32 were found to have hand dermatoses. Skin lesions, except warts, were also found on the hands of 33 persons, 18 males and 15 females, who had denied such lesions. The persons with dermatoses of the group who gave an affirmative and the one that gave a negative answer are given in Table 5. The age and sex distribution did not differ from that of those who gave affirmative answers.

It is evident that in many persons skin diseases escaped examination because the persons had given false negative answers in the questionnaires. Judging from the analysis in the present investigation, only about half of the patients with hand dermatitis answered "yes". The commonest diagnosis in both groups was hand eczema. No attempts were made to distinguish between the types of eczema because the time allowed for routine examination was only 1-2 minutes per person.

Of those persons who had denied skin changes in the questionnaire but been found to have such lesions, the eczemas were extremely mild in all except in 2. One of these 2 was a man who was afraid that he would have to do some other sort of work if his eczema had been known. The other, who had fairly severe eczema, refused to say why he had given a negative answer in the questionnaire.

Mild cutaneous lesions producing no symptoms and which had not induced the persons in question to give an affirmative answer in the questionnaire were not registered except in 792 persons examined at the field study during May and June 1965. Superficial cracks were noted in 29 (3.7 %), cracked nailfold in 116 (14.6 %), obvious dryness in 117 (14.8 %) and reddening or other signs of inflammation in 42 (5.3 %). Several of these persons had more than one type of change. All together 193 persons (24.3 %) had changes of the described mild types.

Table 5. *Conditions diagnosed in 1819 persons who had reported (Yes group) or denied (No group) hand changes in questionnaire*

diagnosis	yes	no
eczema	15	16
paronychia	—	4
senile lentigo	3	—
haemangioma	2	1
circumscribed palmar keratoderma	2	1
acrovesiculatio recidivans	2	1
palmoplantar pustulosis	1	1
scars after burns	—	3
vulnus	—	2
psoriasis	1	1
acrodermatitis atrophicans vasculare	1	—
acrokeratosis verrucosiforme	1	—
erythema multiforme	1	—
lipoma	1	—
onychia	1	—
palmar erythema	1	—
photodermatitis	—	1
ganglion	—	1
dermatophytosis	—	1

Naevi were apparently a type of lesion which the patients had not regarded as skin changes and had therefore not been reported as such in the questionnaires. Field examination for palmar naevi was performed in 1212 persons. The definition was according to van Scott (1957): any discrete pigmented macule or papule measuring 0.5 mm or more in the palms. 67 persons, *i.e.* 5.5 % had palmar naevi.

RESPONSE RATE AND REASONS FOR NOT ATTENDING THE EXAMINATION

2499 persons reported that they had skin changes of the hands apart from ordinary warts, *i.e.* 2.3 % of those taking part in the general health survey. Of these 2499 persons, 1659 (66 %) accepted the offer of an examination at the Department of Dermatology in Lund. The majority (63 %) accepted their first invitation, while 3 % had to be reminded a second time. A third invitation to those not appearing was constantly without result. The 840 persons who did not come to the department were contacted by letter. 603 (72 %) reported why they had not come (Table 6). Those who did not come did not differ in age or sex distribution from those who did. Neither did those living near Lund differ in the percentage of participants from those who lived further away.

Table 6. *Reasons for not attending*

	number of persons
skin changes healed	167
insignificant symptoms	225
already receiving medical treatment	103
lack of time owing to work or household duties	49
difficulty to travel (because of disease, for example)	19
other reasons	40
total	603

The reasons for not attending did not vary with the age of the persons except that the oldest did not report lack of time owing to work. Of those who had had hand lesions at the time of the health survey, the lesions had healed in 82 before they were examined in Lund. These persons were included in the computer analyses.

Of the 1659 persons examined in Lund, the findings in 1551 were analysed in the computer. The remaining 108 were excluded for the following reasons:

A. 17 who had viral warts only.

B. 41 with dermatosis not localized to the hands. Persons with dermatosis of the arms, face, etc. but not of the hands had by mistake given an affirmative answer in the questionnaire. Some of them evidently wanted to have a free examination, though the changes were situated not on the hands but elsewhere.

C. 26 with changes of the hands, but not dermatosis. This group consisted mainly of persons with circulatory disorders, arthritis, arthrosis, Heberden's noduli, etc.

D. 24 who answered "yes" incorrectly for a wide range of other reasons.

INVESTIGATION BY QUESTIONNAIRE

The written invitation to an examination in Lund was accompanied by a questionnaire. The patients were requested to fill in the form and hand it back at the examination in Lund. Those persons who did not reply were reminded again by post and given new questionnaires. If the patients did not reply, a third invitation and questionnaire were sent them, this time with a stamped addressed envelope and an additional short questionnaire which they were requested to fill in and state why they had not come to the examination.

In addition to those 66 %, who appeared for examination, 10 % returned the questionnaire after the first or second invitation. A further 18 % returned the completed questionnaire after they had received the third letter. This means then that only 6 % of those who reported that they had hand changes did not

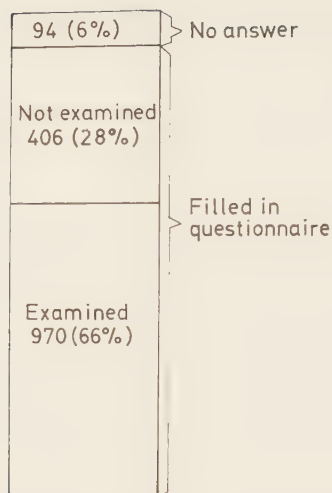


Fig. 2. Information obtained on persons who reported skin changes on their hands.

answer the questionnaires (Fig. 2). The design of the questionnaire was based on a pilot study where the value of certain questions was estimated. Only questions that could be answered in a definite way (simply by "yes" or "no") were used. The purpose of the questionnaire was to obtain information on the group that did not attend the personal examination in Lund.

The questionnaire was designed in such a way as to allow comparison between information given by the patient himself and information obtained at a medical examination.

A comparison was made between the answers of the 970 persons that were examined and the 406 that were not examined but returned questionnaires. No significant difference was found between the group examined and the unexamined group regarding age, sex, civil status, occupation, change of occupation because of skin disease, sick-leave because of skin changes, remuneration from the insurance company because of occupational skin disease, or a history of atopic dermatitis in childhood.

The representation of the various occupational activities among those persons who were examined and those who were not is given in Table 7.

7 % of those examined and 5 % of those who were not examined had changed their occupation because of dermatosis.

Sick-leave because of observed skin changes had occurred in 18 % of those examined and 15 % of those who were not. 1 % of those examined and 3 % of those who were not had received remuneration from insurance companies because of occupational dermatoses. A history of atopic dermatitis in childhood was reported in 13 % of the persons examined and in 10 % of those who were not. Those patients who were examined at the Department of Dermatology in Lund had previously sought medical advice elsewhere somewhat more often

Table 7. *Occupational activities of examined and non-examined persons with hand dermatoses*

occupational activity	examined %	not examined %
employed	44	43
working on own account	6	5
housewives	22	26
housewives with part-time employment	7	6
pensioners	12	11
students	9	9

than those who were not; 58 % and 50 % respectively ($\chi^2=5.13$; $df=1$; $P<0.05$).

Of those examined in Lund, 1 % reported that they had had the disease for up to one month, against 7 % of those who were not examined in Lund. The difference was significant ($\chi^2=40.76$; $df=1$; $P<0.001$). The reason was assumedly that many of those with a brief attack of the disease had recovered by the time they were invited to take part in the examination at the Department of Dermatology in Lund.

SPECTRUM OF HAND DERMATOSES

As the daily reports were received from the communities, persons in whom cutaneous changes had been observed were invited to attend the Department of Dermatology in Lund. Preliminary appointments were made for the examinations and the persons were given a telephone number to the department and told that they could change the time if that offered was unsuitable. The interval between the field study and the examination in Lund was 10-45 days for 1448 persons (93 %) and 61-122 days for 103 persons (7 %).

In 1551 persons who were found to have some disease of the skin of the hands 53 different diagnoses were made. The number of persons with the commonest diagnoses, all together 90 % of the examined persons, is given in Table 8, which also shows to what extent the patients had previously sought medical advice because of skin changes. (See also chapter on eczema.) Persons with certain diseases such as eczema, psoriasis, pustulosis, fungal infections, had often sought medical advice; those with such conditions as senile lentigo, less often.

In addition to the diagnoses included in the table the following conditions were seen (figures in brackets give the number of persons with the respective diagnoses): onychia, not secondary to dermatitis, not mycotic, not psoriatic, (8), purpura (7), haemangioma (6), Dupuytren's contracture (5), telangiectases (5), seborrheic keratosis (4), fibroma (4), granuloma annulare (4), ichthyosis vulgaris (4), physical injury (4), naevus pigmentosus (3), knuckle pads (3), erythema multiforme (3), foreign body granuloma (2), scabies (2), acrodermatitis chronica atrophicans (1), basal cell carcinoma (1), Bowen's disease (1), malignant melanoma (1), glomus tumour (1), fixed eruption (1), furunculosis (1), impetigo contagiosa (1), cheloid (1), disseminated lupus erythematosus (1), parapsoriasis (1), vasculitis (1), poikiloderma vasculare atrophicans (1), polymorphic light eruption (1), scleroderma (1) xanthoma (1), neurotic excoriations (1), diagnosis uncertain (79).

Of the patients with uncertain diagnoses there were some who had mild hand dermatoses and lesions that had healed by the time of the examination and whose history alone would not allow a diagnosis.

In addition to the mentioned main diagnoses supplementary diagnoses were made in 661 patients. Conditions giving rise to a supplementary diagnosis were localized to the hands or other parts of the body, but the figures must be evaluated in the light of the fact that examination was most often limited to the hands and feet.

Table 8. *Commonest diagnoses and previous medical consultation*

diagnosis	number	previous medical consultation (%)
eczema	827	77
senile lentigo	141	3
psoriasis	124	84
vittiligo	72	36
acrovesiculatio recidivans	51	55
circumscribed palmar keratoderma	33	52
palmoplantar pustulosis	27	93
dermatophytosis	23	83
deep fissures	16	56
mycids	14	64
lichen planus	11	55
circumscribed neurodermatitis	11	73
paronychia	11	64
candidiasis	10	80
senile keratosis	10	10
urticaria	10	30

661 *supplementary diagnoses* were made. These consisted of: eczematous dermatitis (281), mycosis (79): localized to the feet in 51, mycids 8, intertrigo 5, erosio interdigitalis 2, seborrhoic keratosis (38), verruca vulgaris (24), paronychia (23), deep fissures (17), pigmented naevus (15) circumscribed neurodermatitis (13), senile lentigo (13), pyoderma (12), onychia, not secondary to dermatitis, not psoriatic, not mycotic, (11), psoriasis (11), acne vulgaris (10), vitiligo (9), Dupuytren's contracture (8), fibroma (7), ichthyosis vulgaris (7), senile keratosis (7), acne rosacea (6), pruritus ani (6), purpura (6), circumscribed palmar keratoderma (5), physical injury (5), venous ulcer (5), acrovesiculatio recidivans (4), haemangioma (4), lipoma (4), urticaria (4), xanthoma (4) folliculitis (3), telangiectases (3), basal cell carcinoma (2), Bowen's disease (2), lichen planus (2), lymphangitis, lymphadenitis (2), discoid lupus erythematosus (1), erythrasma (1), foreign body granuloma (1), furuncle (1), granuloma annulare (1), knuckle pads (1), neurotic excoriations (1), palmoplantar pustulosis (1), pityriasis versicolor (1).

The *sex distribution* of the commonest *main diagnoses* is given in Table 9. In females eczema was more common than in males, as were senile lentigo and candidiasis, while psoriasis and senile keratosis were more common in males. The difference was significant for eczema and senile lentigo ($P < 0.001$) and for psoriasis, candidiasis and senile keratosis ($P < 0.01$) and for dermatophytosis ($P < 0.05$).

The *age distribution* for persons with the commonest diagnoses is given in Table 10.

Table 9. Sex distribution of the commonest diagnoses

diagnosis	number of patients	ratio females/males
eczema	827	2.0***
senile lentigo	141	1.9***
psoriasis	124	0.5**
vitiligo	72	0.7
acrovesiculatio recidivans	51	0.8
circumscribed palmar keratoderma	33	0.6
palmoplantar pustulosis	27	1.5
dermatophytosis	23	0.4*
deep fissures	16	0.6
mycids	14	0.6
lichen planus	11	0.6
circumscribed neurodermatitis	11	1.8
paronychia	11	4.5
candidiasis	10	10/0**
senile keratosis	10	0/10**
urticaria	10	2.3

* denotes a sex difference with $P < 0.05$

** denotes a sex difference with $P < 0.01$

*** denotes a sex difference with $P < 0.001$

binomial distribution with hypothesis $p = 0.5$

Table 10. Age at time of examination

diagnosis	10-19	20-29	30-39	40-49	50-59	60-69	≥ 70 years
eczema	118	142	166	168	129	67	37
senile lentigo	—	—	2	13	29	57	40
psoriasis	4	12	19	30	26	24	9
vitiligo	—	3	16	23	18	9	3
acrovesiculatio recidivans	8	6	12	13	7	5	—
circumscribed p. keratoderma	1	1	1	6	9	11	4
palmoplantar pustulosis	—	7	4	9	5	2	—
dermatophytosis	—	3	5	13	1	—	1
deep fissures	—	1	2	3	4	2	4
mycids	2	—	4	3	5	—	—
lichen planus	—	—	1	4	3	3	—
circumscribed neurodermatitis	—	1	1	2	3	4	—
paronychia	1	1	1	3	4	1	—
candidiasis	1	—	1	3	3	2	—
senile keratosis	—	—	—	—	1	3	6
urticaria	1	2	2	3	—	2	—

Table 11. *Duration of the commonest hand dermatoses before examination*

diagnosis	1-6 months	7-24 months	2-8 years	> 8 years	duration uncertain
eczema	39	44	110	92	2
senile lentigo	6	24	67	33	11
psoriasis	7	5	33	77	2
vitaligo	1	5	28	37	1
acrovesiculatio recidivans	2	11	23	15	—
circumscribed palmar keratoderma	4	7	11	11	—
palmoplantar pustulosis	1	9	8	9	—
dermatophytosis	1	5	10	7	—
deep fissures	2	3	3	7	1
mycids	2	2	8	2	—
lichen planus	4	2	3	2	—
circumscribed neurodermatitis	1	2	3	5	—
paronychia	2	3	6	—	—
candidiasis	2	3	4	1	—
senile keratosis	—	1	—	5	4
urticaria	2	2	2	2	2

Table 12. *Number of patients with sick-leave because of hand dermatoses*

diagnosis	men	women	total
eczema	72	118	190
psoriasis	12	12	24
palmoplantar pustulosis	4	7	11
acrovesiculatio recidivans	2	4	6
dermatophytosis	3	2	5
circumscribed palmar keratoderma	—	3	3
circumscribed neurodermatitis	1	1	2
deep fissures	2	—	2
candidiasis	—	1	1
erythema multiforme	1	—	1
furunculosis	1	—	1
mechanical injury	1	—	1
ichthyosis	1	—	1
paronychia	—	1	1
poikiloderma vasculare atrophicans	1	—	1
impetigo contagiosa	1	—	1
scleroderma	1	—	1
diagnosis unknown	—	2	2
total	103	151	254

Table 13. *Hand dermatoses in persons above 10 years seen at the out-patient department of dermatology, Lund, during 1965. Diagnoses listed in the same order as in table 9*

diagnosis	number of patients	ratio females/males
eczema	766	1.5***
senile lentigo	5	5/0*
psoriasis	155	0.5***
vittiligo	10	0.7
acrovesiculatio recidivans	17	0.7
circumscribed palmar keratoderma	10	0.1*
palmoplantar pustulosis	47	1.2
dermatophytosis	29	0.5
deep fissures	2	1.0
mycids	11	0.2*
lichen planus	16	1.7
circumscribed neurodermatitis	6	2.0
paronychia	13	13/0***
candidiasis	6	2.0
senile keratosis	2	1.0
urticaria	33	1.3

* denotes a sex difference with $P < 0.05$

** denotes a sex difference with $P < 0.01$

*** denotes a sex difference with $P < 0.001$

binomial distribution with hypothesis $p = 0.5$

The expected high frequency of long-standing dermatoses in an investigation of this type is apparent from Table 11.

The sex distribution of the persons with those skin diseases that were the commonest causes of *sick-leave* is given in Table 12. Eczema was the commonest cause of sick-leave and psoriasis, pustulosis and acrovesiculatio were also common causes. These diagnoses were together responsible for 91 % of the incidence of sick-leave because of hand dermatoses. Out of 254 patients who had been on the sick list because of hand dermatoses, 95 had been absent from work for 1 month or less, 113 for 1-6 months and 46 more than 6 months. The differences in this respect between the various diagnostic groups were not significant.

It was not always possible to differentiate between pustulosis and psoriasis with certainty. While it was obvious that in some cases volar changes were components of a more widespread psoriasis, in others it was doubtful whether the pustular skin changes were psoriatic or not. In doubtful cases the diagnosis palmoplantar pustulosis was therefore used. In patients with dermatophytoses, single direct tests for mycelia and fungi cultures may give false negative results,

which may in turn result in a false diagnosis of pustulosis. As to the diagnosis of acrovesiculatio of the hands, it was sometimes doubtful whether interdigital foot mycoses should be regarded as being of any importance.

124 persons had psoriasis of the hands, including 6 with psoriatic changes only on the nails. The psoriatic changes were confined to the hands in 7 %, while the remaining 93 % had psoriasis elsewhere on the body.

To form an idea of the clinical significance of the commonest diagnoses in the present investigation, the frequencies of the conditions recorded at the Department of Dermatology in Lund in 1965 are given in Table 13. The total number of patients above 10 years with skin changes on the hands during this time was 1478, including 57 with verruca vulgaris, a diagnosis that was not included in the present investigation.

It is evident from Table 9 and 13 that the frequency of the diagnoses of eczema, psoriasis, palmoplantar pustulosis, dermatophytosis, mycids, lichen planus and circumscribed neurodermatitis at the out-patient service of our department well reflected the frequency of the diseases in the population studied. Certain diagnoses such as senile lentigo, vitiligo, circumscribed palmar keratoderma, acrovesiculatio recidivans and senile keratosis are much more common than what is observed at the dermatologic out-patient service.

However, many diagnoses of skin diseases of the hands common at the department were less often seen in our survey. Such diagnoses (figures for 1965 within brackets) were scabies (36), urticaria (33), drug reactions (30), erythema multiforme (14), pyoderma (13) and neurotic excoriations (12).

HAND ECZEMA

In what follows the terms *dermatitis* and *eczema* are used synonymously. Four types of hand dermatitis were recognized: *allergic contact dermatitis*, *traumiterative contact dermatitis*, *atopic dermatitis* and *nummular eczema*. Circumscribed neurodermatitis, acrovesiculatio recidivans, mycids and circumscribed keratotic changes in the palms of the hands have been previously considered and are not included in this chapter. Allergic contact dermatitis and traumiterative contact dermatitis are sometimes hereinafter referred to by the common term contact dermatitis. In spite of the history and the examination it was still sometimes difficult to classify the dermatitis. These cases are taken together under the heading *unclassified dermatitis*.

Data on the persons in the above groups are analysed in what follows. In the analyses of the individual eczema groups the reliability of the frequency rate found for nummular eczema will be low because of the small number of patients in this group. For the sake of completion, however, nummular eczema has been included in all comparisons within and between groups of eczema.

Sex distribution

Of the 827 persons with hand dermatitis, 275 were males and 552 were females. The distribution of the various diagnoses is given in Table 14. It is clear from the table that females were predominant in contact dermatitis, particularly in traumiterative contact dermatitis.

Table 14. Sex distribution of hand dermatitis

diagnosis	males	females	total	ratio females/males
traumiterative contact	80	255	335	3.2***
allergic contact	87	199	286	2.3***
atopic	43	42	85	1.0
nummular	13	9	22	0.7
unclassified	52	47	99	0.9
total	275	552	827	2.0***

*** denotes a sex difference with $P < 0.001$
binomial distribution with hypothesis $p = 0.5$

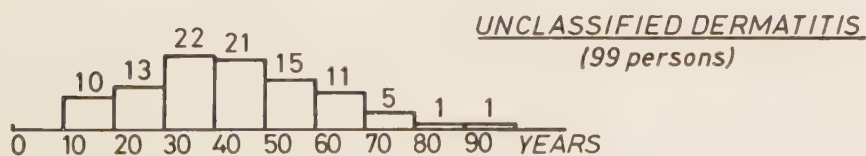
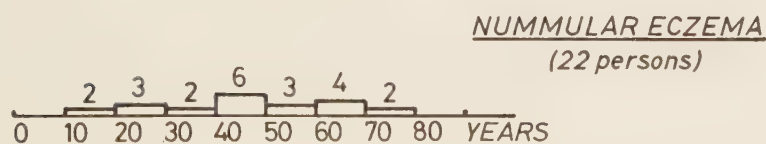
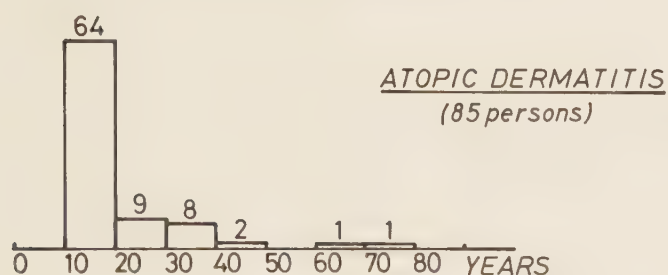
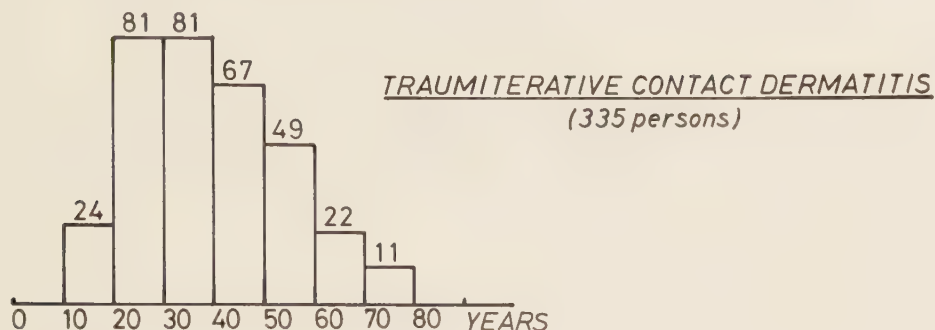
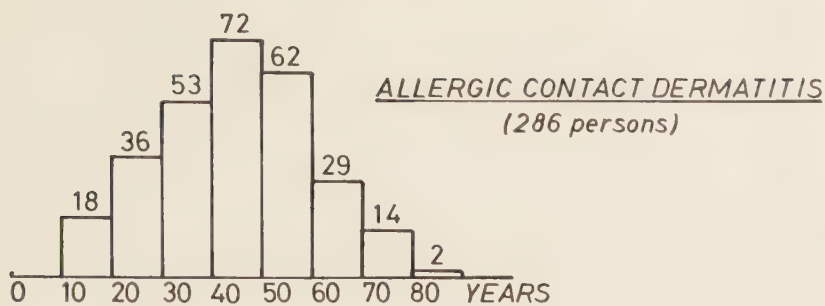


Fig. 3. Age at time of examination.

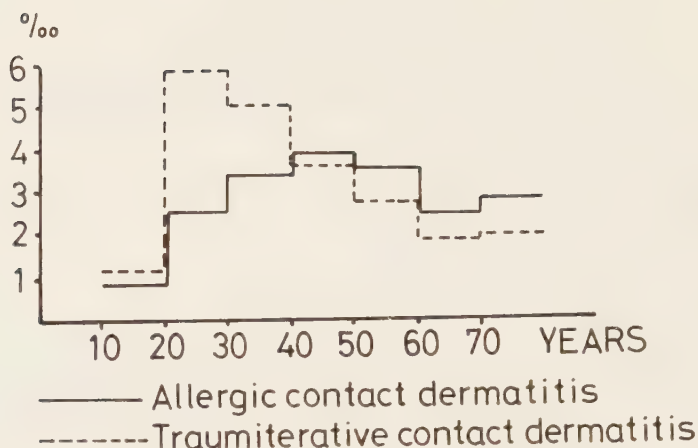


Fig. 4. Observed frequency of contact dermatitis of the hands in persons who attended the general health survey.

Age at time of examination

The age distribution of the persons with hand eczema is given in Fig. 3. Traumiterative contact dermatitis was more common in the lower age groups ($\chi^2 = 23.91$; $df = 6$; $P < 0.001$). The mean age was 39 years for persons with traumiterative contact dermatitis and 45 years for those with allergic contact dermatitis. The median age was 38 and 45 years respectively.

The majority of the persons with atopic dermatitis were between 10 and 20 years of age, while nummular eczema and unclassified dermatitis were more evenly distributed among all the age groups.

The number of cases of contact dermatitis *observed* in the various age groups was compared with that of all persons attending the general health survey (Fig. 4). It is clear from the figure that traumiterative eczema was predominant in persons up to 40 years of age, after which allergic contact dermatitis became somewhat more common.

Age at onset

Fig. 5 shows the distribution of the ages of the persons at time of onset of the various types of eczema. The age at onset was lower for traumiterative eczema than for allergic contact dermatitis ($\chi^2 = 29.31$; $df = 6$; $P < 0.001$). The mean age at onset was 33 years for persons with traumiterative contact dermatitis and 37 years for those with allergic contact dermatitis. The median age at onset was 29 and 37 years respectively. The onset of traumiterative contact dermatitis was particularly common between 20 and 29 years. Atopic hand dermatitis usually appeared before the age of 10. The onset of nummular and unclassified eczema showed no predilection for any particular age group.

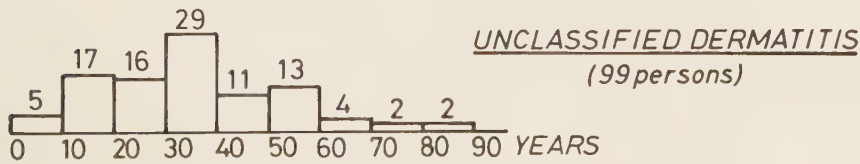
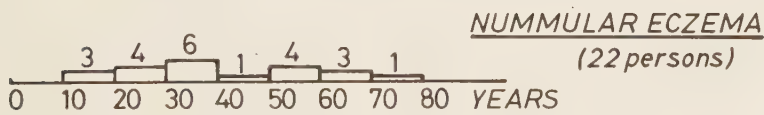
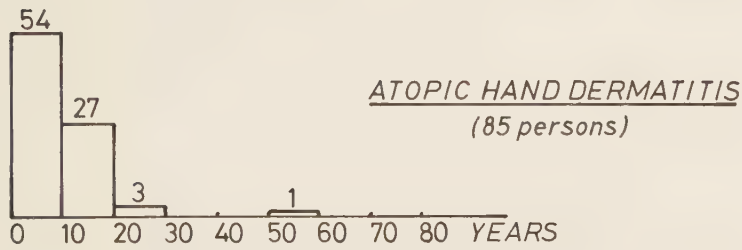
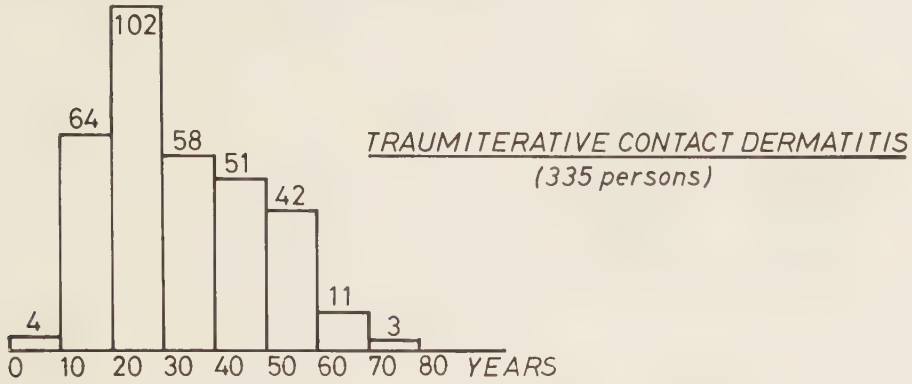
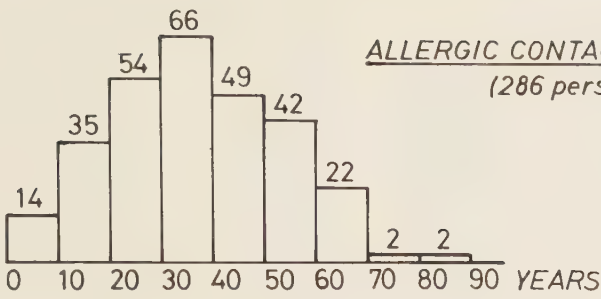
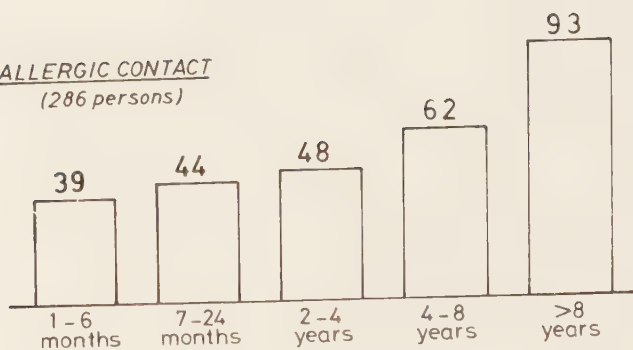
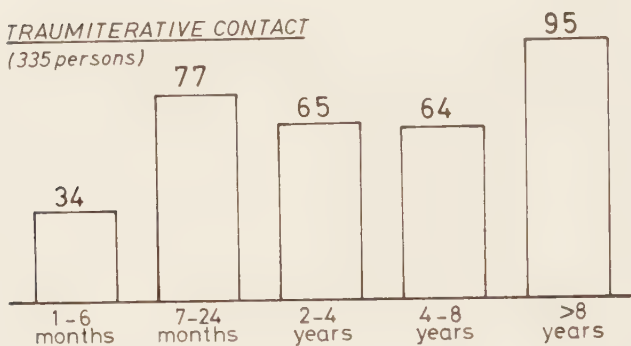


Fig. 5. Age at onset.

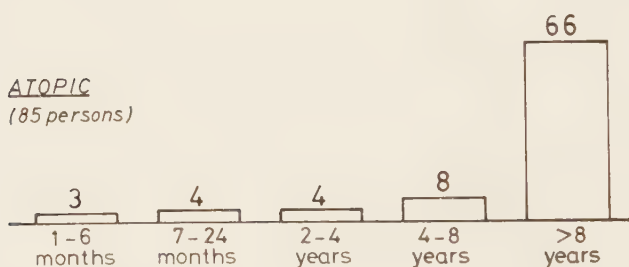
ALLERGIC CONTACT
(286 persons)



TRAUMATIZING CONTACT
(335 persons)



ATOPIC
(85 persons)



NUMMULAR
(22 persons)



UNCLASSIFIED
(99 persons)



Fig. 6. Duration of hand dermatitis before the examination.

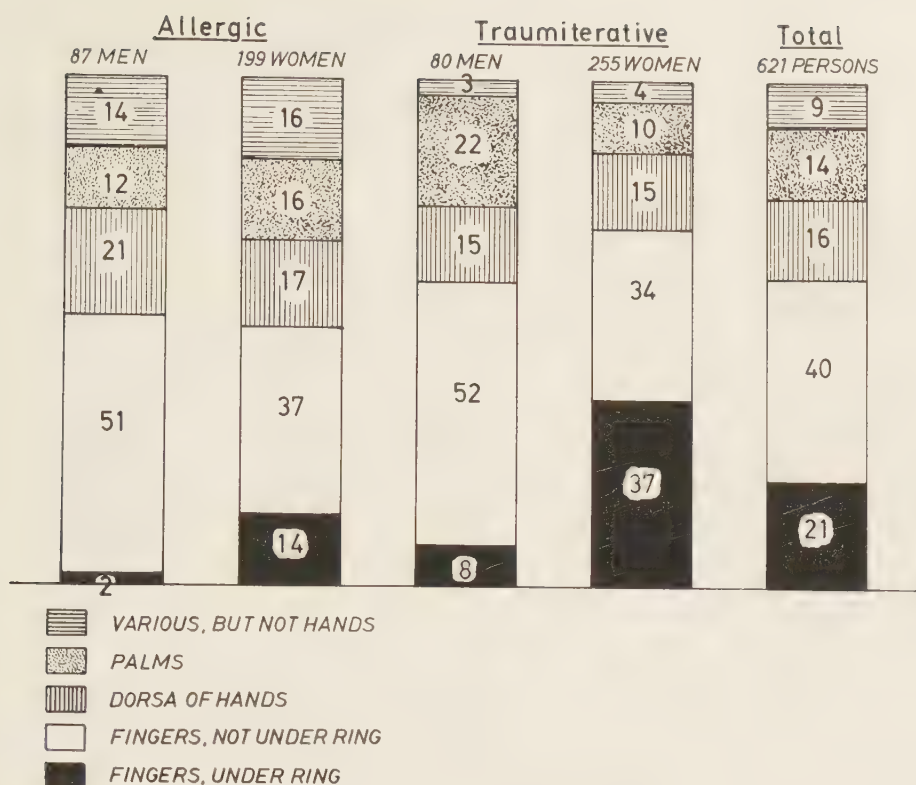


Fig. 7. Site of onset of contact dermatitis (%).

Duration of hand dermatitis before the examination

The duration of the various sorts of hand dermatitis is given in Fig. 6, from which it is apparent that the duration of contact dermatitis was most often long. The mean duration of the disease, calculated from the mean age at onset and the mean age at the time of the survey, was found to be 8 years for allergic, and 6 years for traumiterative contact dermatitis.

The number of patients with a long duration of atopic dermatitis was remarkably large (the investigation included only persons above the age of 10, for which reason most persons with a short history of atopic dermatitis were not included). Nummular and unclassified eczema did not differ in duration from contact eczema.

Site of onset

61 % of the persons reported that the eczema had started on or between the fingers. In 21 % the dermatitis had first appeared under finger rings (Fig. 7). Persons with traumiterative dermatitis reported more often that the dermatitis

Table 15. *Present site of hand dermatitis (%)*

site	allergic contact dermatitis	traum- iterative contact dermatitis	atopic dermatitis	nummular eczema	unclassified dermatitis
under ring only	—	5	—	—	—
interdigital only	6	9	—	—	1
fingertips only	1	4	4	—	—
fingers, elsewhere	21	18	16	9	24
dorsa of hands	9	7	11	45	27
dorsa of hands and fingers	19	12	35	41	13
palms	2	3	4	—	4
palms and fingers	15	10	6	—	13
dorsa of hands and palms	2	2	—	—	4
dorsa of hands and palms and fingers	19	21	9	—	7
wrists	1	—	8	—	4
wrists and fingers	—	—	7	—	—
healed on hands	5	8	—	5	2

had started under the ring than did persons with allergic dermatitis. 14 % of the patients with contact dermatitis had first noticed the eczema on the palms of the hands and 16 % on the dorsa. In 9 % of the persons with contact dermatitis on the hands the eczema had not started on the hands.

Present site of hand dermatitis

The present sites of the changes for allergic and traumiterative dermatitis are given in Table 15.

In most cases the eczema was bilateral, affecting both hands, but particularly unclassified dermatitis was unilateral (33 %). Co-existing eczematous changes on the hands and extramanual changes were noted in 36 % of those with allergic dermatitis, in 15 % of those with traumiterative dermatitis, in 68 % of those with atopic, in 50 % of those with nummular, and in 33 % of those with unclassified dermatitis.

In persons with *allergic contact dermatitis* the skin lesions were confined to the fingers in 28 %, often with involvement of the sides of the fingers. The dorsa of the hands were affected in 49 % with or without co-existing changes on the fingers and palms. 5 % had had changes, but these had disappeared by the time they were examined in Lund. The histories, positive test reactions and often persistent extramanual changes made it probable that the changes had been manifestations of allergic dermatitis.

The *traumiterative dermatitis* was confined to the fingers in 36 % and to the area under finger rings in 5 %, interdigital changes were more pronounced

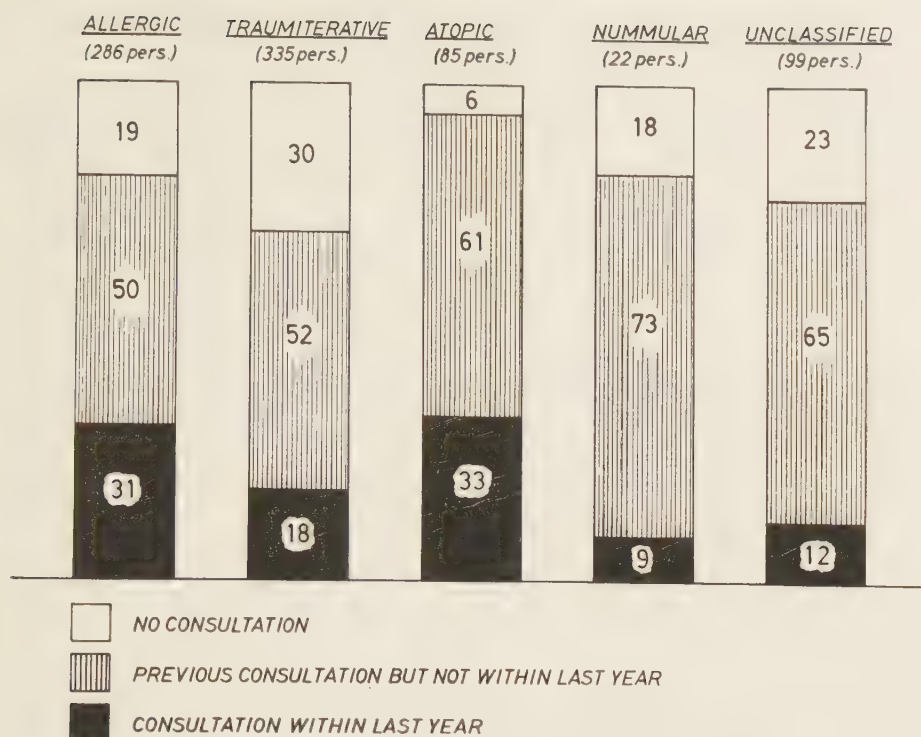


Fig. 8. Frequency of medical consultation because of hand dermatitis (%).

proximally in the webs. The dorsa of the hands were involved in 42 %, mostly in combination with lesions of the fingers and the palms of the hands.

In 20 % the persons with *atopic dermatitis* had changes confined to the fingers, in several cases to the sucked thumb. Changes on the dorsa of the hands were seen in 55 %, often with well defined areas of eczema. In such cases differentiation of the lesions from nummular eczema was based on the patient's history, the general condition of the skin and eczematous lesions of typical appearance on the body.

Hand changes in *nummular eczema* was always confined to the dorsa of the hands or of the fingers.

Previous medical consultation

Of all the persons with hand eczema, 636 (77 %) had on one or more occasions sought medical advice for the condition. 358 (43 %) had consulted dermatologists in private practice or dermatologic out-patients department, while 278 (34 %) had consulted general practitioners.

Fig. 8 shows to what extent the patients in the various eczema groups had sought medical advice and how many were receiving treatment at the time of

Table 16. *Duration of allergic (=A) and traumiterative (=T) contact dermatitis before first medical consultation (%)*

	≤ 1 month	2-6 months	7-24 months	25-96 months	> 8 years	time un- certain	no medical consultation
A	31	16	17	6	2	8	19
T	19	18	16	5	3	10	30

Table 17. *Number and distribution of persons who had been granted sick-leave because of hand dermatitis*

	males	females	total
allergic contact dermatitis	36	64	100
traumiterative contact dermatitis	17	43	60
atopic dermatitis	4	3	7
nummular eczema	2	1	3
unclassified dermatitis	13	7	20
	72	118	190

the present investigation. A person was said to be receiving medical treatment if he had at any time during the last year (12 months) sought medical advice because of hand dermatitis and had treated the hands according to doctor's advice.

Of the subjects with eczema, those with atopic dermatitis sought medical advice most, namely 94 %. The corresponding figures for the other eczema groups were 70-82 %. Of patients with contact dermatitis, those with allergic dermatitis had sought advice more often than those with traumiterative dermatitis ($\chi^2=9.29$; $df=1$; $P<0.01$). The percentage of those who had sought medical advice because of allergic contact dermatitis was lower than the corresponding figure for those with atopic dermatitis ($\chi^2=10.33$; $df=1$; $P<0.01$).

Table 16 shows how long the persons had had their disease before they had consulted a doctor. It is clear from the table that those with allergic contact dermatitis sought advice early (within one month) after the onset of the disease more often than did those with traumiterative dermatitis ($\chi^2=12.66$; $df=1$; $P<0.001$; analysis on two groups: ≤ 1 month, > 1 month).

Previous sick-leave

Of the 827 persons with hand dermatitis, 190 had had sick-leave because of the condition. The number of patients in the different diagnostic groups who had previously been granted sick-leave because of hand dermatitis is given in Table 17. There was no significant difference between females and males re-

Table 18. *Duration of sick-leave because of contact dermatitis*

	≤ 1 month	2-6 months	7-24 months	> 24 months	number of persons with sick-leave
allergic contact dermatitis	28	52	16	4	100
traumiterative contact dermatitis	33	22	5	—	60

garding the percentage of those who had had sick-leave ($\chi^2 = 2.39$; $df = 1$; $P > 0.05$). Allergic contact dermatitis was the main cause of sick-leave. Of the 286 persons with allergic contact dermatitis, 100 (35 %) had been granted sick-leave and of the 335 with traumiterative contact dermatitis 60 (18 %) had been granted sick-leave ($\chi^2 = 23.46$; $df = 1$; $P < 0.001$). Of the 85 persons with atopic dermatitis, 7 had had sick-leave because of hand dermatitis. Here it should, however, be pointed out that 64 of the 85 persons with atopic dermatitis were below 20 years of age and many were students without employment.

The duration of sick-leave because of allergic and traumiterative contact dermatitis is given in Table 18. Of the 100 persons granted sick-leave because of allergic contact dermatitis of the hands, 28 were granted sick-leave for up to 1 month, 52 for 2-6 months, 16 for half a year to 2 years, and 4 persons for more than 2 years. Of the 60 persons granted sick-leave because of traumiterative hand dermatitis, 33 had been granted such leave for up to 1 month, 22 for 2 to 6 months and 5 for half a year to 2 years. The difference in this respect between patients with allergic contact dermatitis and those with traumiterative contact dermatitis was significant ($\chi^2 = 12.34$; $df = 3$; $P < 0.01$).

All the preceding data on medical consultation, frequency and duration of sick-leave because of contact dermatitis suggest that the symptoms were more pronounced in persons with allergic contact dermatitis.

Previous testing

All together 147 (18 %) of the 827 persons with hand dermatitis had been tested epicutaneously before the present investigation. The results of testing in 16 patients with allergic contact dermatitis, 16 with traumiterative, 2 with atopic, 1 with nummular and 7 with unclassified dermatitis who had been tested with standard substances at the department immediately before the present investigation were included in the analysis of the test results obtained in the present study. But in most of those persons who had previously been tested epicutaneously the testing had been limited, often with only one allergen, and the tests had often been performed long before the present survey. Therefore, these persons were re-tested, if possible.

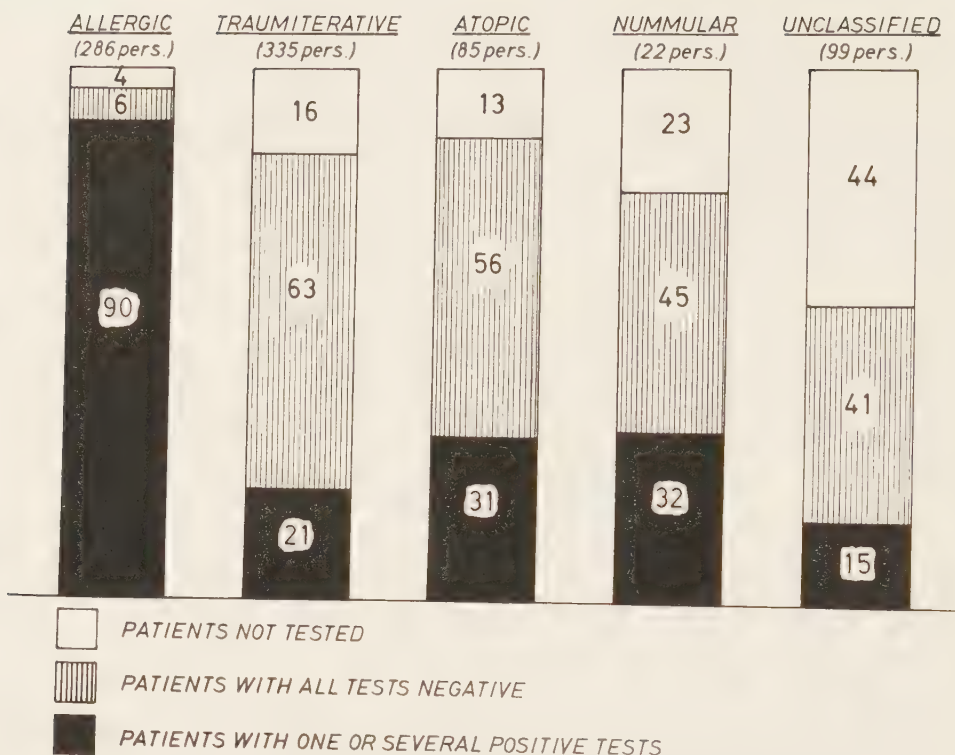


Fig. 9. Testing of patients with hand dermatitis (%).

Testing

It is often difficult to exclude contact allergy as a cause or aggravating factor of hand eczema. All persons with hand eczema were therefore offered testing. Of 827 persons with hand eczema, 126 (15 %), however, declined testing. The main reasons for such refusal were that the eczema was mild or that it was disappearing spontaneously or that the persons had been tested previously.

Of 712 persons tested, 250 were males and 462 females. 341 persons (48 %) reacted positively in one or more of the tests. Of the males, 96 (38 %) had positive reactions and of the females, 245 (53 %) were positive. Positive tests were thus seen in a larger proportion of the females than of the males ($\chi^2 = 13.9$; $df = 1$; $P < 0.001$). Of the 341 persons with positive reactions, 276 (81 %) reacted to at least one of the 21 substances in the standard series. 82 % of the males and 80 % of the females with positive reactions reacted to one or more of the standard substances. The relative number of positive test reactions increased with age (χ^2 -test for trend; $0.01 > P > 0.001$).

Fig. 9 shows to what extent the patients were tested and how often the tests were positive. Positive tests were noted in all eczema groups. The tests were

Table 19. *Number of persons with positive reactions to substances in the standard test series. 712 persons, 250 males and 462 females, were tested*

substance	males	females	total
potassium bichromate	24	16	40
cobalt chloride	4	41	45
nickel sulfate	—	56	56
balsam of Peru	18	46	64
p-phenylenediamine	4	14	18
p-aminoazobenzene	7	12	19
epoxy resins	2	9	11
formaldehyde	13	28	41
phenol formaldehyde resin	8	23	31
carbamide formaldehyde resin	6	13	19
diethylstilbestrol	3	3	6
cinnamon	6	15	21
diaminodiphenylmethane	11	22	33
mercaptobenzothiazole	2	13	15
tetramethylthiuramdisulfide and dipentamethylenethiuramdisulfide	3	11	14
balsam of pine and spruce	9	26	35
wood tars	11	22	33
coal tar	5	6	11
colophony	5	14	19
neomycin sulfate	1	8	9
hydroxyquinolines	1	6	7

positive in 90 % of the cases with allergic contact dermatitis and the results thus largely confirmed the diagnosis. Of the patients, 10 % had no positive test that confirmed the diagnosis of allergic contact dermatitis but in these cases the history and clinical findings strongly suggested exposure to an allergen as the most important aetiological factor. The relative number of positive test reactions was definitely lower in the other groups of dermatitis. There was no difference in frequency of positive tests between the other eczema groups ($\chi^2 = 3.10$; $df = 3$; $P < 0.05$).

Testing in this study was based on the available literature and the experience of the department. The subject has since been comprehensively reviewed by Fisher (1967), Bandmann and Dohn (1967) and Hjorth and Fregert (1968). The reader is referred to these monographs for further discussion on testing and allergen exposure.

Test reactions to various substances

Table 19 shows the occurrence of positive test reactions to the substances in standard series, and Table 20 to other substances. Table 21 presents the number

Table 20. Number of persons tested and number of positive test reactions

substance	number of tested persons			number of pos. reactions		
	males	females	total	males	females	total
turpentine	250	462	712	13	18	31
N,N'-diphenyl-p-phenylenediamine and N-phenyl-N'-cyclohexyl- p-phenylenediamine	174	311	485	3	2	5
N,N'-diphenyl-p-phenylenediamine N-phenyl-N'-cyclohexyl- p-phenylenediamine	76	151	227	1	—	1
phenyl- β -naftylamine	76	151	227	3	1	4
diphenyl-guanidine	202	383	585	2	2	4
sodium-dimethyl-dithiocarbamate	189	335	524	2	4	6
lanolin	144	232	376	1	1	2
parabens	210	378	588	2	16	18
benzocaine	199	348	547	1	2	3
topical medicaments	129	240	369	1	8	9
hand lotions and creams	77	151	228	5	10	15
balsam of Tolu and benzoin and essential oils	46	205	251	3	15	18
pyrethrum flowers, extract of	250	462	712	20	50	70
plants (a piece of leaf or flower)	166	295	461	2	8	10
<i>Primula obconica</i> , ether extract of	54	244	298	7	28	35
vegetables	153	278	431	4	16	20
orange peel	123	272	395	1	6	7
perfumes (chemoderms, Firmenich)	118	192	310	2	5	7
perfumes (to detergents, Sunlight)	60	126	186	1	7	8
polish	95	180	275	1	6	7
benzalkonium chloride	6	4	10	—	1	1
benzethonium chloride	167	272	439	3	8	11
cetyl pyridinium chloride	98	182	280	—	3	3
mercury, metal	98	183	281	1	2	3
glycols	70	114	184	1	10	11
stearyl amines	181	319	500	2	8	10
detergents	65	111	176	1	4	5
benzyl alcohol and benzaldehyde	188	334	522	1	2	3
hydrazine hydrate	52	110	162	—	2	2
glove-cleanser	3	4	7	2	—	2
2,2'-dihydroxy 5,5'-dichloro- diphenylmethane	3	5	8	—	1	1
p-toluenediamine	60	118	178	—	1	1
p-toluidine	68	113	181	—	1	1
bacitracin	52	111	163	—	1	1
soap	188	334	522	—	1	1
bisphenol A	8	12	20	—	1	1
bisphenol A and benzestrol	16	20	36	—	—	—
hexamethylenetetramine	36	93	129	—	—	—
hexachlorophene	68	147	215	—	—	—
tween 80 and span 80	53	77	130	—	—	—
	52	76	128	—	—	—

Table 21. *Number of persons with positive test reactions and number of persons with traced eczematogenous exposure to allergens*

substance	persons with positive reactions	persons with traced eczematogenous exposure to allergens	
		number	%
potassium bichromate	40	32	80
cobalt chloride	45	35	78
nickel sulfate	56	49	88
balsam of Peru	64	18	28
p-phenylenediamine	18	8	44
p-aminoazobenzene	19	9	47
epoxy resins	11	4	36
formaldehyde	41	19	46
phenol formaldehyde resin	31	12	39
carbamide formaldehyde resin	19	11	58
diethylstilbestrol	6	—	—
cinnamon	21	16	76
diaminodiphenylmethane	33	28	85
mercaptobenzothiazole	15	15	100
tetramethylthiuramdisulfide and dipentamethylenethiuramdisulfide	14	13	93
balsam of pine and spruce	35	12	34
wood tars	33	11	33
coal tar	11	9	82
colophony	19	13	68
neomycin sulfate	9	8	89
hydroxyquinolines	7	6	86

of persons with positive test reactions and the number of persons with traced eczematogenous exposure to allergens. The occurrence of positive test reactions to various substances in occupational dermatitis and in housewives' eczema is given in Table 22. The relative frequency of positive test reactions in males and females is given in Fig. 10.

In what follows the results given in the tables will be presented in detail. The number of reactions is given for each substance separately as well as the number of traced eczematogenous exposures. Special attention is given to the role of such substances as causes of occupational and housewives' eczema.

If a person had dermatitis caused or aggravated by contact with an allergen, he was advised at the interview how to avoid the eczematogenous allergen. Furthermore, all persons with positive tests were given stencilled lists of products possibly containing the allergens. These lists were the same as those devised and routinely used at the Department of Dermatology, Lund.

Chromium. 712 persons (250 males and 462 females) were tested epicutaneously with potassium bichromate.

Table 22. Number of positive test reactions in patients with occupational dermatitis and housewives' eczema. 175 persons with occupational dermatitis and 242 persons with housewives' eczema were tested

substance	occupational dermatitis	housewives' eczema
potassium bichromate	23	10
cobalt chloride	19	17
nickel sulfate	19	23
balsam of Peru	9	16
p-phenylenediamine	7	8
p-aminoazobenzene	8	6
epoxy resins	4	7
formaldehyde	13	9
phenol formaldehyde resin	11	10
carbamide formaldehyde resin	5	4
diethylstilbestrol	4	2
cinnamon	10	3
diaminodiphenylmethane	17	8
mercaptobenzothiazole	3	9
tetramethylthiuramdisulfide and dipentamethylenethiuramdisulfide	7	6
balsam of pine and spruce	11	11
wood tars	13	9
coal tar	3	5
colophony	6	9
neomycin sulfate	2	3
hydroxyquinolines	1	3

40 persons (24 males and 16 females) reacted positively to chromium. 366 persons were tested at the same time also intracutaneously with 0.1 ml of 1 mM potassium bichromate. The results of the epicutaneous tests and the intracutaneous tests were invariably concordant. Hypersensitivity to chromium was the commonest type of allergy among the males, and was the only type of allergy that was more common among males than among females ($\chi^2 = 11.5$; $df = 1$; $P < 0.001$). The patient's history, the findings at inspection of the skin and a positive test suggested that allergy to chromium was the main cause or a contributory cause of the hand eczema in 32 cases. 23 persons with occupational dermatitis reacted positively to chromium and in 16 the allergy was the main cause or a contributory cause of the occupational disease of the skin. 10 persons with housewives' eczema reacted positively to chromium and in 9 this allergy was regarded as the chief cause or a contributory cause of housewives' eczema. Patients with positive tests and known contact with products which probably or certainly contained chromium were advised how to reduce contact with such products to a reasonable minimum. Products most often found as suspected causes of hand eczema were: matches, ash-trays with burnt match

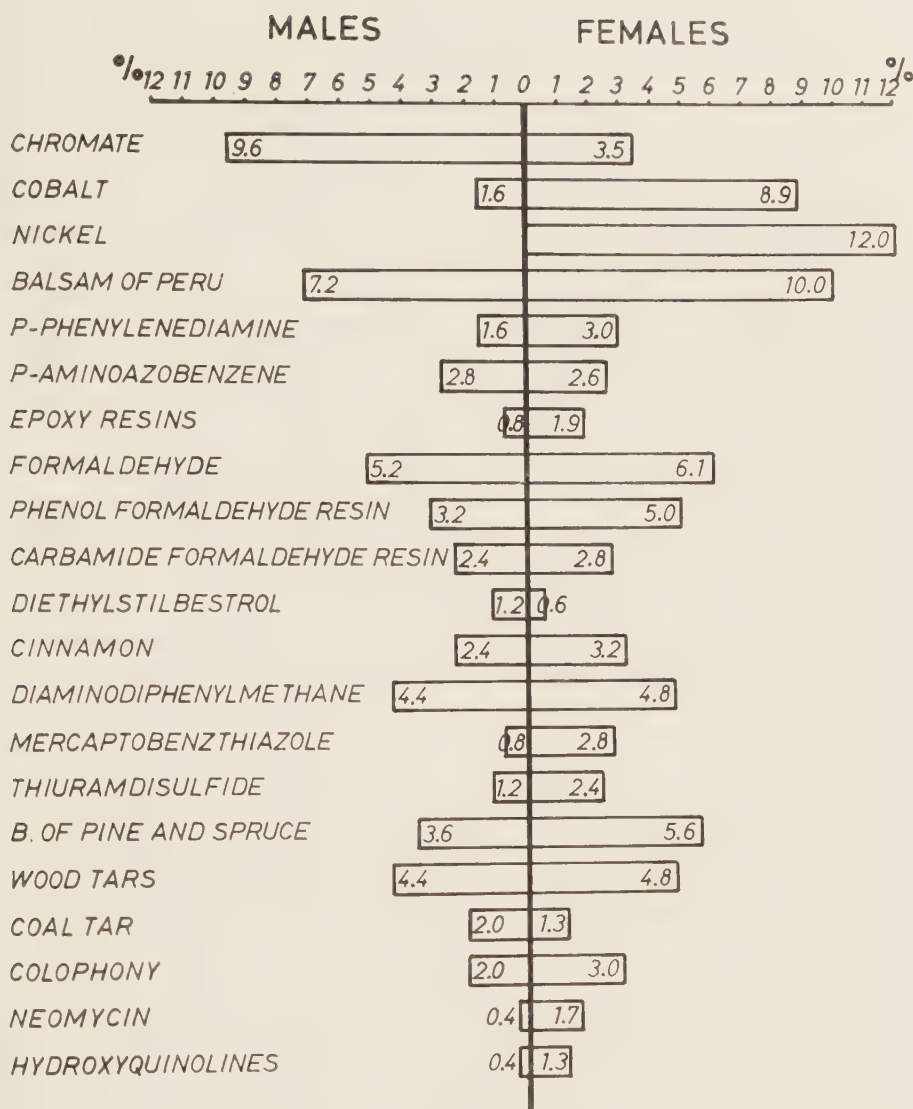


Fig. 10. Relative frequency of positive test reactions to substances in the standard series.

heads, dusters for cleaning ash-trays, cement, mortar, wood ash, tanning substances in leather gloves, tanning agents, chromate for lithography and anti-rust paints. The persons with occupational dermatitis due to chromium included: three charwomen, two builders, two plumbers, two lithographers, two metal workers, one bricklayer, one eternite worker, one printer, one tannery worker and one mason.

Besides advice at the interview the patients were informed of the possible allergen contacts listed in a stencilled form:

Leather: gloves and hat bands (shoe leather can often be tolerated). Cement (dried concrete appears to be tolerated). Ash: especially woodash and ash of burned garbage. Matches: care should be taken not to have the match box in the pockets and the pockets should be brushed out if you have carried matches. Use a cigarette lighter. Do not clean or scratch your ears with matches. Anti-rust paint: yellow and red paint for protecting metal from rusting.

Nickel. Epicutaneous tests with nickel sulfate were performed on 712 persons (250 males and 462 females). 56 persons, all females, reacted positively to nickel.

Intracutaneous tests were carried out on 366 persons. The results of the epicutaneous and intracutaneous tests were invariably concordant. Nickel allergy was the commonest allergy found among the females. The patient's history, findings at inspection of the skin and a positive test suggested that allergy to nickel was the main cause or a contributory cause of the hand eczema in 49 cases. 19 persons with occupational dermatitis reacted positively to nickel and in 11 the allergy was considered the main cause or a contributory cause of the occupational skin disease. 23 persons with housewives' eczema reacted positively to nickel and in all of them the allergy was regarded as the main cause or a contributory cause of the housewives' eczema. Patients with positive tests and known contact with products which probably or certainly contained nickel were advised how to reduce contact with such products to a reasonable minimum. Products which were most often found as suspected causes of hand eczema were: coins, cupboard and box handles, keys and zips. Many of them were advised to replace metal handles by plastic handles. They were advised to paint metal parts, other than stainless steel, in the kitchen and to replace metal parts in their clothes and in their children's clothes by plastic coated parts (buckles, press buttons, suspender clips etc.). The group with occupational dermatitis includes cashiers, shopassistants and clerks.

Besides advice at the interview the patients were informed of the possible allergen contacts listed in a stencilled form:

Metal parts of clothing: suspender clips, press-buttons, hooks and eyes, zips, brassière clips or hooks, buttons. Use instead such articles of plastic material, plastic-coated articles or of painted metal or of some other material. Jewelry (pure gold and silver can usually be tolerated): necklaces and necklace-locks, ear rings and clips, bracelets, rings. Other personal articles that can also be obtained in other sorts of materials: lipstick holder, powder box, handbag and purse catches and locks, cigarette lighter, shaving apparatus, wristlet watch, metal parts of eye-glasses, hair pins and clasps, keys, key rings, pocket knife, pens. In home: cupboard handles, kitchen utensils, toaster, scissors, needles, pins and safety pins, thimble, telephone number disc, metal parts of vacuum cleaner, hooks, screws, clips, chain of sink or bath plug. Silver coins. Examples of other metal articles that may contain nickel: Parts of typewriting machine, clip fastener, hole punch.

Those articles which are essential but unavailable in other material can often be painted, or the metal parts can be covered with adhesive tape. Stainless steel, e.g. sinks, does not appear to imply any risk for eczema. If possible wear gloves when handling money.

Cobalt. 712 persons (250 males and 462 females) were tested epicutaneously with cobalt chloride.

45 persons (4 males and 41 females) reacted positively to cobalt. The relative frequency of allergy to cobalt was higher in females than in males ($\chi^2 = 14.5$; $df = 1$; $P < 0.001$). In 366 persons intracutaneous testing was performed at the same time. The results of the intracutaneous tests and epicutaneous tests were invariably concordant. The patient's history, the findings at inspection of the skin and the positive reaction to the test suggested that allergy to cobalt was the main cause or a contributory cause of the hand eczema in 35 cases. Of the 4 males with a positive reaction to cobalt, 3 had also reacted positively to chromium. Of the 41 females, 29 were also positive for nickel, 6 for chromium and 1 for chromium, cobalt and nickel. 19 persons with occupational dermatitis reacted positively to cobalt and in 8 the allergy was considered the main or contributory cause of the occupational skin disease. 17 persons with housewives' eczema were positive to cobalt, and in 13 this allergy was considered the main or a contributory cause of housewives' eczema.

Patients with positive tests and known contact with products which probably or certainly contained cobalt were advised how to reduce contact with such products to a reasonable minimum. Products which were most often found as suspected causes of hand eczema were the same as those with nickel allergy. In addition, cement, linseed oil, pigments for painting, porcelain and polyester catalysis were found as suspected causes of hand eczema. Besides advice at the interview the patients were given a stencilled form (same as that handed to those allergic to nickel).

Balsam of Peru. 712 persons (250 males and 462 females) were tested epicutaneously with balsam of Peru.

64 persons (18 males and 46 females) reacted positively to balsam of Peru. The patient's history, the findings at inspection of the skin and a positive test suggested that the allergy to balsam of Peru was the main cause or a contributory cause of the hand eczema in 18 cases. 9 persons with occupational dermatitis reacted positively to balsam of Peru and in 2 the allergy was considered the main cause or a contributory cause of the occupational skin disease. 16 persons with housewives' eczema reacted positively to balsam of Peru and in 6 the allergy was considered the main cause or a contributory cause of the housewives' eczema. Patients with positive tests and known contact with products which probably or certainly contained balsam of Peru were advised how to reduce contact with such products to a reasonable minimum. Topical medications such as ointments for pain and wounds, compresses, cough mixtures, purgatives were most often found as suspected causes of hand eczema. In addition all patients were advised to avoid contact with orange peel, vanilla and cinnamon and, as far as possible, with perfumed cosmetics, soaps and detergents. Non-perfumed soap and detergents were recommended. Besides advice at the interview the patients were informed of the possible allergen contacts listed in a stencilled form:

Perfumes, perfumed soap, hair lotion, beauty cream, hand cream, wound cream and ointment for babies, eau de cologne, peels of oranges and lemons, grape fruit, bitter oranges (and marmalades of these fruits), pastries and cakes with essences, Danish pastries, sweets (especially caramels), cough mixtures, throat tablets, balsam of spruce and pine (e.g. on wood), perfumed tobacco, rectal suppositories containing balsam of Peru, taste tinctures, icecream, Coca cola, tar, tooth-paste (avoid contact with hands), spices: cinnamon, cloves, pepper, natural vanilla, curry. Spices may occur in: ginger biscuits and cakes, Chile sauce, tomato ketchup, tinned herrings, spiced cheese, preserved beetroots and cucumbers, liver paste, vermouth, wheat bread, buns and cakes. Use only unperfumed toilet soap.

p-Phenylenediamine. 712 persons (250 males and 462 females) were tested epicutaneously with *p*-phenylenediamine.

18 persons (4 males and 14 females) reacted positively to *p*-phenylenediamine. The patient's history, the findings at inspection of the skin and a positive reaction to the test suggested that allergy to *p*-phenylenediamine was the main cause or a contributory cause of the hand eczema in 8.

7 persons with occupational dermatitis reacted positively to *p*-phenylenediamine and in 1 the allergy was considered to be the cause of the occupational skin disease. 8 persons with housewives' eczema reacted positively to *p*-phenylenediamine and in 3 the allergy was considered the main or a contributory cause of housewives' eczema. Patients with positive tests and known contact with products which probably or certainly contained *p*-phenylenediamine were advised how to reduce contact with such products to a reasonable minimum. Dyed textiles were most often suspected of causing hand eczema. Three housewives reacted with eczema to certain garments, one person had an occupational dermatosis and was working in a cloth-mill. All patients who reacted positively to *p*-phenylenediamine were also advised to avoid exposure, as far as possible, to rubber, especially rubber gloves.

p-Aminoazobenzene. 712 persons (250 males and 462 females) were tested epicutaneously with *p*-aminoazobenzene.

19 persons (7 males and 12 females) reacted positively to *p*-aminoazobenzene. The patient's history, the findings at inspection of the skin and a positive test suggested that allergy to *p*-aminoazobenzene was the main cause or a contributory cause of the hand eczema in 9. Of the 19 persons with a positive reaction to *p*-aminoazobenzene, 14 had also reacted positively to *p*-phenylenediamine. 8 persons with occupational dermatitis reacted positively to *p*-aminoazobenzene and in 2 cases the allergy was considered a main or contributory cause of the occupational skin disease. 6 persons with housewives' eczema reacted positively to *p*-aminoazobenzene and in 3 cases the allergy was considered the main cause or a contributory cause of the housewives' eczema. Patients with positive tests and known contact with products which probably or certainly contained *p*-aminoazobenzene were advised how to reduce contact with such products to a reasonable minimum. Products which were most often found as suspected causes of hand eczema were: stockings, other dyed textiles such as nylon gloves, methylated spirits and ball-pens.

Those patients who had eczema on the legs were given special prescriptions. It became apparent that these patients tolerated stockings of some factory makes but not of others. If the patients found it difficult to find stockings which they could tolerate, they were given an address where they could obtain unstained stockings and informed how to stain the stockings with non-allergic pigment.

Patients who reacted positively to p-aminoazobenzene were given the same advice as the patients who reacted to p-phenylenediamine.

Epoxy resins. 712 persons (250 males and 462 females) were tested epicutaneously with epoxy resins.

11 persons (2 males and 9 females) reacted positively to the epoxy resins. The patient's history, the findings at inspection of the skin and a positive test suggested that the allergy to epoxy resins was the main cause or a contributory cause of the hand eczema in 4 cases. 4 persons with occupational dermatitis reacted positively to epoxy resins and in 1 case the allergy was considered to be the main cause of the occupational skin disease. 7 persons with housewives' eczema reacted positively to epoxy resins and in 2 the allergy was considered to be the main cause or a contributory cause of the housewives' eczema. Patients with positive tests and known contact with products which probably or certainly contained epoxy resins were advised to avoid these products.

One patient was working in an epoxy industry and had an occupational contact dermatitis. One female working in the household had dermatitis on the hands and on the neck where she wore a necklace. Tests with material from the necklace were positive. One woman had dermatitis on the hands at areas of contact with the apron, which was made of PVC-plastic, probably containing an epoxy plasticizer-stabilizer.

Formaldehyde. 712 persons (250 males and 462 females) were tested epicutaneously with formaldehyde.

41 persons (13 males and 28 females) reacted positively to formaldehyde. The patient's history, the findings on inspection of the skin and a positive test suggested that the allergy to formaldehyde was the main cause or a contributory cause of the hand eczema in 19 cases. 13 persons with occupational dermatitis reacted positively to formaldehyde and in 3 the allergy was considered the main or a contributory cause of the occupational disease. 9 persons with housewives' eczema reacted positively to formaldehyde and in 6 the allergy was considered the main cause or a contributory cause of the housewives' eczema. Patients with positive tests and known contact with products which probably or certainly contained formaldehyde were advised how to reduce contact with such products to a reasonable minimum.

Products which were most often found as suspected causes of hand eczema were: textiles, cosmetics and detergents. Formaldehyde was considered of importance for one ironing-woman, one floor grinder using formaldehyde resin

and one fire-man using extinguishers containing formaldehyde. Analysis for formaldehyde in clothes and in cosmetics was done at the department according to the method of Blohm (1959). Besides advice at the interview the patients were informed of the possible allergen contacts listed in a stencilled form:

Textiles (cotton, wool, artificial and natural silk, nylon and other synthetic fibres). To protect yourself against formaldehyde in your clothing you should observe the following recommendations: Underclothes in contact with the skin should be made of material that can be boiled. You should wear an under-blouse of white cotton with the same collar-size and the same sleeve-length as your blouse or dress. All clothing worn next to the skin should be boiled for three hours in water without any additive before it is worn for the first time. This removes all formaldehyde. The clothes can afterwards be worn and washed in the usual way. Should the eczema persist despite these measures all clothing that cannot be washed must be examined chemically.

Phenol formaldehyde resin. 712 persons (250 males and 462 females) were tested epicutaneously with phenol formaldehyde resin.

31 persons (8 males and 23 females) reacted positively to phenol formaldehyde resin. 11 persons with positive reactions to phenol formaldehyde resin also reacted positively to formaldehyde. The patient's history, the findings at inspection of the skin, and a positive test suggested that the allergy to phenol formaldehyde resin was the main cause or a contributory cause of the hand eczema in 12 cases. 11 persons with occupational dermatitis reacted positively to phenol formaldehyde resin and in 3 cases the allergy was considered to be the main cause or a contributory cause of the occupational skin disease. 10 persons with housewives' eczema reacted positively to phenol formaldehyde resin, and in 6 of them the allergy was considered to be the main cause or a contributory cause of the eczema. Articles most often suspected as causes of hand eczema were: plastic articles of "bakelite" type, such as handles of irons, pots and saucepans, where intimate contact in association with heat and moisture appeared to explain the dermatitis. These cases of dermatitis were localized to the tips of the fingers and the palm often only or preponderantly of one of the hands. One person working in an isolating company was allergic to isolation material (glass wool) containing phenol formaldehyde. One person was a telephonist and had eczema on and around one ear. Patients with positive tests and known contact with products containing phenol formaldehyde resin were advised how to reduce contact with such products to a reasonable minimum.

Carbamide formaldehyde resin. 712 persons (250 males and 462 females) were tested epicutaneously with carbamide formaldehyde resin.

19 persons (6 males and 13 females) reacted positively to carbamide formaldehyde resin. All but one also reacted positively to formaldehyde. The patient's history, the findings at inspection of the skin and a positive test suggested that the allergy to carbamide formaldehyde resin was the main cause or a contributory cause of hand eczema in 11 cases. 5 persons with occupational dermatiti

reacted positively to carbamide formaldehyde resin and in 3 the allergy was considered to be the main cause or a contributory cause of the occupational skin disease. 4 persons with housewives' eczema reacted positively to carbamide formaldehyde resin, and in 2 the allergy was considered to be the main cause or a contributory cause of the eczema. Patients with positive test and known contact with products which probably or certainly contained carbamide formaldehyde resin were advised how to reduce contact with such products to a reasonable minimum. Articles which most often were suspected to cause hand eczema were: textiles and playing cards. Of the persons with occupational dermatitis two worked with "non-iron" textiles and one was a floor-grinder, who used formaldehyde resins.

Diethylstilbestrol. 712 persons (250 males and 462 females) were tested epicutaneously with diethylstilbestrol.

6 persons (3 males and 3 females) reacted positively to diethylstilbestrol. 4 persons with occupational dermatitis and 2 with housewives' eczema reacted positively to diethylstilbestrol. There was no reason to suspect that the allergy to diethylstilbestrol was the cause of the hand eczema in any of the 6 persons.

Cinnamon. 712 persons (250 males and 462 females) were tested epicutaneously with cinnamon.

21 persons (6 males and 15 females) reacted positively to cinnamon. The patient's history, the findings at inspection of the skin and the positive test suggested that the allergy to cinnamon was the main cause or a contributory cause of the hand eczema in 16 cases. 10 persons with occupational dermatitis reacted positively to cinnamon and in 2 the allergy was considered the main cause or a contributory cause of the occupational skin disease. 3 persons with housewives' eczema reacted positively to cinnamon and in these the allergy was considered the main cause or a contributory cause of the housewives' eczema. Patients with positive test and known contact with products which probably or certainly contained cinnamon were advised to avoid such products as far as possible. One baker and one shop-assistant had allergy to cinnamon.

Besides advice at the interview the patients were given written recommendations (same as given to patients with positive reaction to balsam of Peru).

Diaminodiphenylmethane. 712 persons (250 males and 462 females) were tested epicutaneously with diaminodiphenylmethane.

33 persons (11 males and 22 females) reacted positively to diaminodiphenylmethane. The patient's history, the findings at inspection of the skin and a positive test suggested that diaminodiphenylmethane was a main cause or a contributory cause of hand eczema in 28 cases. 17 persons with occupational dermatitis reacted positively to diaminodiphenylmethane and in 13 cases the allergy was considered the main cause or a contributory cause of the occupational skin disease. 8 persons with housewives' eczema reacted positively to diaminodi-

phenylmethane and in 6 the allergy was regarded as the main cause or a contributory cause of the housewives' eczema. Patients with positive tests and known contact with products which probably or certainly contained diaminodiphenylmethane were advised how to reduce contact with such substances to a reasonable minimum. Rubber gloves were most often found as suspected causes of hand eczema. Besides advice at the interview the patients were informed of the possible allergen contacts listed in a stencilled form (stencil for allergy to rubber):

Rubber gloves, electric cables, tubes, door knobs and handles and edgings and borders of: washing machines, dish-washing machines, vacuum cleaners, electric kitchen equipment, toasters, milking machines, tubes for garden, laundry and compressed air. Bottle stoppers, thermos flask stoppers, rings for conserving-jars, edges of refrigerator, electric plugs, soap supports, bathrooms mats, hand shower (edge), rubber cables, key protectors, door stops, foam rubber mattresses, bottom of bedstead, inflatable mattresses, broomsticks, rubber brushes, adhesives, buttons (especially on overalls), sleeve patches (at elbows), zips, garters, shoes, boots, galoshes, teething rings, toys, wheels on toys, rubber heels of shoes (contact with palm of hand), balls, cycle handle-bars, cycle tyres and tubes, car window wipers, brushes for washing cars, handle of lawn mower, writing pads, rubber bags, teat rubber (milking machine), transport and conveyor band, shock absorber on machines, doors in industrial buildings, insulation tape, hammer handles, washers.

Mercaptobenzothiazole. 712 persons (250 males and 462 females) were tested epicutaneously with mercaptobenzothiazole.

15 persons (2 males and 13 females) reacted positively to the substance. The patient's history, the findings at inspection of the skin and a positive test suggested that the allergy for mercaptobenzothiazole was the main cause or a contributory cause of the hand eczema in these cases. 3 persons with occupational dermatitis and 9 with housewives' eczema reacted positively to mercaptobenzothiazole, and in these cases the allergy was considered a contributory cause or the main cause of housewives' eczema. Patients with positive tests and known contact with products which probably or certainly contained mercaptobenzothiazole were advised how to reduce contact with such products to a reasonable minimum. Rubber gloves were particularly suspected to cause hand eczema. Besides advice at the interview the patients were informed of the possible allergen contacts listed in a stencilled form (stencil for allergy to rubber).

Thiuramdisulfides. 712 persons (250 males and 462 females) were tested epicutaneously with tetramethylthiuramdisulfide and dipentamethylenethiuramdisulfide.

14 persons (3 males and 11 females) reacted positively to thiuramdisulfides. The patient's history, the findings at inspection of the skin and a positive test suggested that the allergy for thiuramdisulfides was the main cause or a contributory cause of the hand eczema in 13 cases. 7 persons with occupational dermatitis and 6 with housewives' eczema reacted positively to thiuramdi-

sulfides and in these cases the allergy was considered the main cause or a contributory cause of housewives' eczema. Patients with positive tests and known contact with products which probably or certainly contained thiuramdisulfides were advised how to reduce contact with such products to a reasonable minimum. It was especially rubber gloves which were found to be suspected causes of hand eczema. Other suspected articles were hard rubber bands and rubber cloth for offset-printing.

Besides advice at the interview the patients were informed of the possible allergen contacts listed in a stencilled form (stencil for allergy to rubber).

Balsam of spruce and pine. 712 persons (250 males and 462 females) were tested epicutaneously with balsams of spruce and pine.

35 persons (9 males and 26 females) reacted positively to the balsams. The patient's history, the findings at inspection of the skin and a positive test suggested that the allergy to the balsams was the main or a contributory cause of hand eczema in 12 cases. 11 persons with occupational dermatitis reacted positively to the balsams and in 4 the allergy was considered the main cause or a contributory cause of the occupational hand disease. 11 persons with housewives' eczema reacted positively to the balsams, but in none of them was the allergy thought to be the cause of the housewives' eczema. Patients with positive tests and known contact with products which probably or certainly contained balsam of spruce and pine were advised to avoid such products as far as possible. Things which were suspected to cause hand eczema were: spruce and pine twigs, freshly cut pinetrees and woodwork. The persons with occupational dermatitis due to the balsams included: one flower shop assistant, one joiner, one woodcutter and one builder. Most contacts with the balsams occurred during handicraft lessons at school or in association with woodwork during leisure hours. One person had acute eczema after dressing the Christmas tree.

Wood tars. 712 persons (250 males and 462 females) were tested epicutaneously with wood tars.

33 persons (11 males and 22 females) reacted positively to wood tars. The patient's history, the findings at inspection of the skin and a positive test suggested that the allergy to wood tars was the main cause or a contributory cause of the hand eczema in 11 cases. 13 persons with occupational dermatitis reacted positively to wood tars but in none of these was the allergy considered the cause of the occupational skin disease. 9 persons with housewives' eczema reacted positively to wood tars, and in 4 the allergy was considered the main cause or a contributory cause of the housewives' eczema. Patients with positive tests and known contact with products which probably or certainly contained wood tars were advised to avoid such products as far as possible. Topical medicaments containing wood tars were most often suspected as causes of hand eczema.

Coal tar. 712 persons (250 males and 462 females) were tested epicutaneously with coal tar.

11 persons (5 males and 6 females) reacted positively to coal tar. The patient's history, the findings at inspection of the skin and a positive test suggested that the allergy to coal tar was the main cause or a contributory cause of the hand eczema in 9 cases. 3 persons with occupational dermatitis reacted positively to coal tar and in 2 the allergy was considered the main cause or a contributory cause of the occupational hand disease. 5 persons with housewives' eczema reacted positively to coal tar, and in 2 the allergy was considered the main cause or a contributory cause of the housewives' eczema. Patients with positive tests and known contact with products which probably or certainly contained coal tar were advised to avoid such products as far as possible. Those substances which most often were suspected to cause hand eczema were: local treatment with substances containing coal tar, insulation tape, wood preservatives, rubber with admixture of tar. One of the persons with the occupational dermatitis was a worker in a rubber factory, the other was a person working with wood preservatives.

Colophony. 712 persons (250 males and 462 females) were tested epicutaneously with colophony.

19 persons (5 males and 14 females) reacted positively to colophony. The patient's history, the findings at inspection of the skin and a positive test suggested that the allergy to colophony was the main cause or a contributory cause of hand eczema in 13 cases. 6 persons with occupational dermatitis reacted positively to colophony, and in one the allergy was considered to be the main cause or a contributory cause of the occupational skin disease. 9 persons with housewives' eczema reacted positively to colophony and in 6 cases the allergy was considered the main cause or a contributory cause of the housewives' eczema. Patients with positive tests and known contact with products which probably or certainly contained colophony were advised to avoid such substances as far as possible. Products which were most often found as suspected causes of hand eczema were: adhesive tape, furniture polish, saw-dust. Many of the persons had treated fissures and wounds with adhesive plasters and this had caused a flaring-up of the eczema. Besides advice at the interview the patients were informed of the possible allergen contacts listed in a stencilled form:

Balsam of pine and spruce, furniture polish, adhesive tape, soap, varnish, modelling clay, resin for violin strings, sealing wax, stove blacking, iron putty, wax for transmission belts, resin for gymnasts and wrestlers, water-fast colours in artist's pens, isolation tape.

Neomycin. 712 persons (250 males and 462 females) were tested epicutaneously with neomycin.

9 persons (1 male and 8 females) reacted positively to neomycin. The pa-

tient's history, the findings at inspection of the skin and a positive test suggested that the allergy to neomycin was the main cause or a contributory cause of the hand eczema in 8 cases. 2 persons with occupational dermatitis and 3 with housewives' eczema reacted positively to neomycin and in these cases the allergy was considered the main cause or a contributory cause of the condition. Patients with positive reactions to neomycin were advised to avoid medicaments containing neomycin.

Hydroxyquinolines. 712 persons (250 males and 462 females) were tested epicutaneously with hydroxyquinolines.

7 persons (1 male and 6 females) reacted positively to hydroxyquinolines. The patient's history, the findings at inspection of the skin and a positive test suggested that allergy to hydroxyquinolines was the main cause or a contributory cause of the hand eczema in 6 cases. One person with occupational dermatitis and 3 with housewives' eczema reacted positively to hydroxyquinolines. Patients were advised to avoid medicaments containing hydroxyquinolines.

Turpentine. 712 persons (250 males and 462 females) were tested epicutaneously with turpentine.

31 persons (13 males and 18 females) reacted positively. The patient's history, the findings at inspection of the skin and a positive test suggested that the allergy to turpentine was the main cause or a contributory cause of the hand eczema in 23 cases. 10 persons with occupational dermatitis reacted positively to turpentine and in 5 the allergy was considered the main cause or a contributory cause of the occupational skin disease. 9 persons with housewives' eczema reacted positively to turpentine, and in 6 the allergy was considered the main cause or a contributory cause of the hand eczema. Patients with positive tests and known contact with substances which probably or certainly contained turpentine were advised how to reduce contact with such products to a reasonable minimum. Products which were most often found as suspected causes of hand eczema were: turpentine, oil paints, shoe-cream and polishing wax.

N,N'-diphenyl-p-phenylenediamine and N-phenyl-N'-cyclohexyl-p-phenylenediamine. 712 persons (250 males and 462 females) were tested epicutaneously with these antioxidation agents.

9 persons (6 males and 3 females) showed a positive reaction. The patient's history, the findings at inspection of the skin and a positive test suggested that the allergy for one or both of these rubber chemicals was the main cause or a contributory cause of the hand eczema in 7 cases. Four persons with occupational dermatitis had positive tests, and in 2 the allergy was considered to be the main cause or a contributory cause of the occupational skin disease. One person with housewives' eczema showed a positive test and the allergy was considered to be a possible contributory cause of the patient's hand eczema. Patients with positive tests and known contact with products which probably

or certainly contained these chemicals were advised how to reduce contact with such products to a reasonable minimum. Rubber gloves were in one case found as suspected cause of hand eczema. The two persons with occupational dermatitis due to rubber were both working at a rubber factory. Besides advice at the interview the patients were informed of the possible allergen contact listed in a stencilled form (stencil for allergy to rubber).

Phenyl- β -naphthylamine. 585 persons (202 males and 383 females) were tested with phenyl- β -naphthylamine.

4 persons (2 males and 2 females) reacted positively to phenyl- β -naphthylamine. The patient's history, the findings at inspection of the skin and a positive test suggested that allergy to phenyl- β -naphthylamine was the main cause or a contributory cause of the hand eczema in 3 cases. Patients with positive tests and known contact with products probably or certainly containing phenyl- β -naphthylamine were advised to avoid such substances as far as possible. Two persons with occupational dermatitis reacted positively to phenyl- β -naphthylamine and in one case the allergy was considered the cause of the occupational skin disease. This person was working at a rubber factory. None of the persons with housewives' eczema reacted positively to phenyl- β -naphthylamine. Besides advice at the interview the patients were informed of the possible allergen contacts listed in a stencilled form (stencil for allergy to rubber).

Diphenylguanidine. 524 persons (189 males and 335 females) were tested with diphenylguanidine.

6 persons (2 males and 4 females) reacted positively to this substance. The patient's history, the findings at inspection of the skin and a positive test suggested that the allergy to diphenylguanidine was the main cause or a contributory cause of the hand eczema in 3 cases. Two persons with occupational dermatitis reacted positively to diphenylguanidine and in both these cases the allergy was considered the main cause or a contributory cause of the occupational dermatitis. Two persons with housewives' eczema reacted positively to diphenylguanidine, and in both this allergy was considered the main cause or a contributory cause of the hand eczema. Patients with positive tests and known contact with products which probably or certainly contained diphenylguanidine were advised how to reduce contact with such products to a reasonable minimum. One of the patients with occupational dermatitis, where allergy to diphenylguanidine was regarded as the cause of the hand eczema, was working at a rubber factory, the other at a food industry and used rubber gloves during work. All persons with a positive reaction to diphenylguanidine were informed of the possible allergen contacts listed in a stencilled form (stencil for allergy to rubber).

Lanolin. 588 persons (210 males and 378 females) were tested epicutaneously with lanolin containing 5 % salicylic acid.

18 persons (2 males and 16 females) reacted positively. The patient's history, findings at inspection of the skin and a positive test suggested that allergy to lanolin was a contributory cause of the hand eczema in 9 cases. 3 persons with occupational dermatitis reacted positively to lanolin, and in one the allergy was considered the main cause of the occupational skin disease. 8 persons with housewives' eczema reacted positively to lanolin and in 5 the allergy was considered the main cause or a contributory cause of the hand eczema. Patients with positive tests and known contact with products which probably or certainly contained lanolin were advised to avoid such products. The products which were most often found as suspected causes of hand eczema were: hand lotions and creams, local medicaments, soaps and cosmetics. Products which were known to contain lanolin were used by 9 of the 18 persons who reacted positively to lanolin. The person who had an occupational dermatitis and lanolin allergy used a hand cream which had been supplied at his working place. This hand cream contained lanolin. Test with the ointment also produced a positive reaction.

"Parabens" (p-hydroxybenzoic esters). 547 persons (199 males and 348 females) were tested with paraben esters.

3 persons (1 male and 2 females) reacted positively. 2 persons were using local medicaments containing "paraben" at the time of the examination. The third person had been sensitized to an antimycotic agent, which contained 5 % ethylparahydroxybenzoate.

Benzocaine. 369 persons (129 males and 240 females) were tested with benzocaine.

9 persons (1 male and 8 females) reacted positively. At the time of the testing 2 patients were using local medicaments containing benzocaine.

Topical medicaments. 228 persons (77 males and 151 females) were tested.

15 persons (5 males and 10 females) reacted positively to used local medicaments. Positive reactions were produced by ointments and creams containing balsam of Peru, neomycin, N-butyl-2 hydroxy-4-chlorbenzamid (Jadit®), N-aethyl-N-crotonoyl-o-toluidin (Eurax®) and hydroxyquinolines. Aggravation of the eczema was usually evident, and the patients were advised to avoid the use of these medicaments.

Hand lotions and creams. 251 persons (46 males and 205 females) were tested.

18 persons (3 males and 15 females) reacted positively to hand cosmetics which they said they used. Of these 18 persons with positive reactions, 2 had occupational dermatitis and 11 housewives' eczema. The positive tests were, as a rule, unexpected. The patients were advised to avoid their hand cosmetics. The patient's history, the findings at inspection of the skin and a positive test made it probable that allergy to the hand cosmetics was the main cause or a

contributory cause of the hand eczema in all 18 cases. One of the patients reacted strongly to the hand cream supplied at his working place. It was, above all, 2 preparations that caused the positive reactions.

Balsam of Tolu and benzoin and essential oils. Testing with these balsams and five essential oils was done routinely at the department to chart the spectrum of balsam allergy. 712 persons (250 males and 462 females) were tested.

70 persons (20 males and 50 females) reacted positively. 59 of these had positive reactions also for balsam of Peru. No dermatitis directly assignable to balsam of Tolu or benzoin or essential oils was noted, but patients who reacted positively to these balsams and aetherols were given the same list of substances as those who were positive to balsam of Peru.

Pyrethrum. 461 persons (166 males and 295 females) were tested with a commercial extract of pyrethrum flowers.

10 persons (2 males and 8 females) reacted positively to pyrethrum. The patient's history, the findings at inspection of the skin and a positive test suggested that the allergy to pyrethrum was the main cause or a contributory cause of the hand eczema in 7. Six of them had used anti-mothpreparations containing pyretrin and this might have contributed to maintenance of the eczema. 2 housewives reported a definite flare-up of symptoms in association with the use of a mothspray. One person had an acute dermatitis from the actual plant *Pyrethrum rubrum*.

Plants and vegetables. 431 persons (153 males and 278 females) were tested epicutaneously with an ether extract of *Primula obconica* (Agrup, Fregert, Hjorth and Övrum 1968).

20 persons (4 males and 16 females) reacted positively to primula. The patient's history, the findings at inspection of the skin and a positive test made it probable that the allergy to primula was the main cause or a contributory cause of the hand eczema in 4. Two persons with occupational dermatitis reacted positively to primula and in these cases the allergy was considered the main cause of the occupational skin disease. One person with housewives' eczema reacted positively to primula and in that person the allergy was considered to be the main cause of the hand eczema.

298 persons (54 males and 244 females) were tested for allergy to one or more plants (other than *Primula obconica*) which they had in their homes, gardens, working places or places where they spent their leisure hours. The plants for which the persons were tested varied according to the patient's history and the tests were performed with pot plants, leaves and flowers, which the patients took along with them to the department. 35 persons (7 males and 28 females) reacted positively to various plants other than *Primula obconica*. 10 of the persons with positive tests for plants in their environments had occupational dermatitis and 19 had housewives' eczema.

Table 23. Positive test reactions to plants

plant	number of positive reactors	number of tested persons
<i>Primula obconica</i> , ether extract of	20	431
<i>Pelargonium</i>		
<i>zonale</i>	10	78
<i>grandiflorum</i>	1	32
<i>Begonia</i>		
<i>X semperflorens</i> cult.	6	101
<i>rex</i> cult.	1	33
tulips	6	20
<i>Narcissus</i>		
<i>poeticus</i>	3	9
<i>pseudo-narcissus</i>	3	8
<i>tazetta</i>	1	4
<i>Sainpaulia ionantha</i>	5	154
<i>Abutilon X hybridum</i> cult.	4	45
<i>Streptocarpus X hybridus</i> cult.	2	21

Plants, which produced reactions, judged as allergic, are listed on Table 23.

Moreover positive reactions were found due to (one positive reaction for each): *Chrysanthemum* sp., *Sinningia X hybrida*, *Fuchsia X hybrida*, *Cyclamen persicum*, *Rhododendron simsii*, *Hippeastrum X hybridum*, *Codiaeum variegatum*, *Nerium oleander*, *Ficus elastica*, *Pyrethrum rubrum* and elm pollen.

Tests were carried out with all together 124 different plants, of which 23 produced positive reactions. Those most frequently giving reactions were *Pelargonium*, *Begonia*, tulips, *Sainpaulia*, *Narcissus*, *Abutilon* and *Streptocarpus*. All reactions were due to leaves except in 3 persons who reacted to the flower of *Sainpaulia ionantha* and one who reacted to the flower of *Streptocarpus hybridus*. 73 positive reactions in 53 persons were obtained. However, also several primary irritant reactions occurred especially to *Abutilon* and also *Pelargonium* and reactions registered as allergic should therefore be accepted with caution. Primary irritant reactions due to plants is a well recognized phenomenon (Woods 1963).

7 persons (1 male and 6 females) reacted to vegetables. These vegetables were carrots, cauliflower, leek, yellow onion, red onion and celery.

Other test reactions. Positive reactions occurred to the following substances: mercury (11), propylene glycol (10), stearyl amine (5), benzalkonium chloride (11), benzethonium chloride (3), cetyl pyridinium chloride (3) and detergents (3). The test reactions were of such a nature that it was not possible to decide with certainty whether they were allergic reactions. The results of these tests were not considered to warrant any instructions to the subjects to avoid contact with any particular substances, since the anamnestic data were, as a rule, not suggestive.

Table 24. *Present diagnoses in persons with a history of atopic dermatitis in childhood*

	males	females	total
atopic dermatitis	43	42	85
allergic contact dermatitis	6	12	18
traumiterative contact dermatitis	14	40	54
nummular eczema	—	—	—
unclassified dermatitis	—	2	2
other dermatoses	2	5	7

Atopic dermatitis in relation to hand eczema

Atopic dermatitis in relation to hand eczema was made the subject of a further analysis. Fig. 5 gives the age at onset of the hand changes in atopic dermatitis. Atopic hand dermatitis occurred in 85 persons, 43 males and 42 females. In 29 of these persons the onset occurred on the hands. The fingers, especially the thumb sucked in infancy, and the wrists were common sites of onset of the dermatitis. In 56 persons, however, changes on the hands appeared only after the atopic dermatitis had manifested itself elsewhere on the body. In 64 % the atopic dermatitis had appeared on the hands before the age of 10 years.

Atopic dermatitis appears to be of importance not only in the typical cases of atopic hand eczema, but also as a predisposing factor to other sorts of dermatitis.

In addition to the 85 persons who had atopic dermatitis of the hands at the time of the examination, 81 persons, 22 males and 59 females, reported previous atopic dermatitis in childhood. Thus 10 % of the examined males and 11 % of the females had a present atopic dermatitis or a history of previous atopic dermatitis. In several cases the earlier occurrence of atopic dermatitis in childhood was not known to the patient until after the parents had been consulted. Only histories of unequivocal atopic dermatitis were accepted, so that the figures given here for atopic dermatitis must be regarded as minimum figures.

The present diagnoses in those persons who had had atopic dermatitis in childhood are given in Table 24. Of 286 persons who had allergic contact dermatitis, 18 (6 %) reported that they had had atopic dermatitis in childhood. Of 335 persons with traumiterative dermatitis, 54 (16 %) had a history of atopic dermatitis in childhood. Of the 54 persons with traumiterative dermatitis and previous atopic dermatitis in childhood, 14 were men and 40 were women. Of the 22 persons with nummular eczema, none had a clear history of atopic dermatitis in childhood. Two of the 99 persons with unclassified dermatitis and 7 of 724 persons with other hand dermatoses had a history of earlier atopic dermatitis.

The low frequency of atopic dermatitis in the history of persons who had

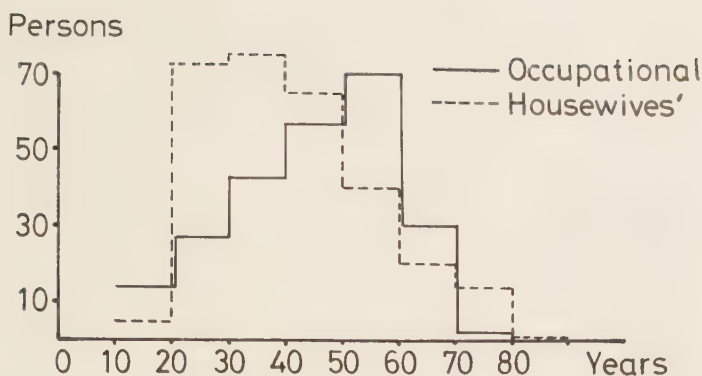


Fig. 11. Age distribution of 246 persons with *occupational dermatoses* and 288 persons with *housewives' dermatoses*.

diagnoses other than eczema must be evaluated with a certain reservation since patients with other dermatoses, in contrast with the patients with hand eczema, were, as a rule, examined on only one occasion. Therefore information from the parents with regard to atopic dermatitis in childhood was most often not obtained.

The persons with traumiterative dermatitis had a history of atopic dermatitis more often than those with allergic contact eczema ($\chi^2 = 14.5$; $df = 1$; $P < 0.001$). The incidence of present or previous atopic dermatitis was the same in males and females with hand eczema.

Occupational dermatosis and housewives' dermatosis

Of the 1551 persons examined, 85 reported that they had changed their occupation because of hand dermatosis. At the time of the examination 246 (16 %) were considered to have hand dermatoses in which occupational exposure was considered to be a major causal or contributory factor. In the following, these skin conditions will be named *occupational dermatoses*.

Of the 246 persons with occupational dermatoses, 144 (59 %) were males and 102 (41 %) were females. The age distribution is given in Fig. 11, which shows that occupational dermatoses occurred in all occupationally active age groups, and in this material they were increased in frequency up to the age of 60.

84 persons (34 %) who had occupational dermatoses had been granted sick-leave because of the hand dermatoses and 56 persons (19 %) with housewives' dermatoses. 16 persons with occupational dermatoses and 11 persons with housewives' dermatoses had had more than 6 months' sick-leave. Table 25 gives the 15 occupations where occupational dermatoses were most common. The chief industries and branches in the area studied are reflected in the table.

Contact dermatitis occurred in 174 of the 246 persons with occupational der-

Table 25. 15 groups of occupations in which hand dermatoses were most common

	males	females	total
metal industry	18	2	20
agriculture	15	1	16
house cleaning	1	13	14
graphic industries	9	2	11
textile industries	6	5	11
rubber industries	3	6	9
plant and flower nurseries	3	6	9
communications	8	1	9
shop and warehouse work	2	6	8
bakers and pastrycooks	7	1	8
food industry	5	3	8
office work	3	5	8
hotel and restaurant work	—	7	7
building work	7	—	7
medical nursing profession	1	5	6

matoses on the hands, and was thus the largest group of occupational dermatosis localized to the hands (71 %). The other occupational dermatoses were (number of patients within brackets): psoriasis (16), deep fissures (13), erosio interdigitalis (7), unclassified dermatitis (7), paronychia (5), circumscribed palmar keratoderma (4), atopic dermatitis (4), palmoplantar pustulosis (4), nummular dermatitis (2), vitiligo (2), foreign body granuloma (2), pyodermia (2), traumatic injury (1), onycholysis (1), lichen planus (1), circumscribed neurodermatitis (1).

Of the 174 persons with occupational contact dermatitis, 21 had a history of atopic dermatitis in childhood. Of these, 9 had allergic contact dermatitis and 12 traumiterative contact dermatitis.

288 persons (19 %) of the persons examined had hand dermatoses, in which household work was considered a major causal or contributory factor. In the following these conditions will be named *housewives' dermatoses*. This last group is often not classified under the heading of occupational dermatosis, but housewives actually form the largest occupational group with hand diseases. One reason for separate consideration of housewives' dermatoses is the fact that the occupational indemnity law does not include this group.

The term *housewives' eczema* is so commonly used that we preferred this expression and the term *housewives' dermatosis* in spite of the fact that 3 men were considered to belong to this group.

271 of the persons with housewives' dermatosis had contact dermatitis, 8 had atopic dermatitis, 1 nummular eczema, 2 unclassified dermatitis, 3 interdigital erosion and 3 paronychia.

Of the 271 persons with housewives' contact dermatitis, 29 had a history of

Table 26. *Number of persons with contact dermatitis due to occupation and own housework*

	occupational	housewives'	total
allergic contact dermatitis	97	103	200
traumiterative contact dermatitis	77	168	245
	174	271	445

atopic dermatitis in childhood. Of these, 6 had allergic and 23 traumiterative contact dermatitis.

The housewives' dermatoses were commonest in the ages between 20 and 49 and were equally distributed among these age groups (Fig. 11). Allergic housewives' eczema started under finger-rings in 17 % and traumiterative housewives' eczema started under the rings in 36 % of the cases. 59 % of the patients with housewives' eczema were found to use rubber gloves and 7 % used plastic gloves in their household work.

The distribution of allergic and traumiterative contact dermatitis in persons with occupational and housewives' dermatitis is given in Table 26. Allergic dermatitis was more common (56 %) among the patients with occupational contact dermatitis while traumiterative dermatitis was overrepresented (62 %) among those with household contact dermatitis ($\chi^2 = 13.5$; $df = 1$; $P < 0.001$). Of 97 persons with occupational allergic contact dermatitis, 46 were men and 51 women, and of 77 with occupational traumiterative contact dermatitis, 48 were men and 29 were women.

Management of patients with hand eczema

Patients with hand eczema were informed about any contact allergy they might have and were given advice how to reduce the risk of allergic contact to a reasonable minimum. General advice and instructions were given to housewives with allergic and traumiterative contact dermatitis according to a stencilled form used routinely at the department:

To facilitate healing and prevent recurrence of your hand eczema you should observe the following instructions. Washing of the hands: use only lukewarm water and the soap should be used sparingly. If soap is used, it should not contain sulphur or tar. Rinse your hands thoroughly after you have washed them with soap and dry them properly, especially between the fingers. Change your towel often. Avoid, as far as possible, contact with detergents. When used, follow the manufacturer's instructions carefully, otherwise the concentration may be undesirably strong. Keep the package or container clean so that, *e.g.*, concentrated detergent or washing powder on the outside of the packet or bottle does not come into contact with the skin. Avoid direct contact with hair shampoo. Let someone else wash your hair or use plastic gloves. Avoid contact with cleaning products for metals, beeswax, floor, car, furniture, and window polish. Avoid contact of the skin with solvents and stain removers, *e.g.*, white spirit, petrol, trichlorethylene, turpentine and thinner. Do not peel or press oranges, lemons or grape-

fruit with the naked hands. Do not rub in hair lotion, hair cream or dye with the naked hands. Avoid exposure of the hands to severe cold. Finger rings should not be worn during housework or any other kind of work, not even after the eczema has healed. Wash the inside of the rings often and then let them lie in ammonia water (1 tablespoonful per 1/2 litre) over night and then rinse them thoroughly. Never wash the hands with soap with the rings on. Washing of dishes should preferably be done under running water. Use a long-handled brush. If gloves are worn during washing of dishes and clothes, they should be of plastic material and not of rubber, the latter being liable to cause eczema. Protective gloves should never be worn for more than 15-20 minutes at a time. If water happens to come under the gloves, these should be taken off at once. Turn the gloves inside out and rinse them under running hot water two or three times a week. Sprinkle with talc before they are used again, as they must be completely dry. Cotton gloves can be worn with advantage under plastic gloves. Cotton gloves should be washed as soon as they have been used a couple of times. Buy several pairs of plastic and cotton gloves at a time. The skin of the hand is very sensitive for at least 4-5 months after the eczema has disappeared. Therefore follow the above instructions carefully during this time. Machines for washing dishes and for washing clothes are recommended for preventing further attacks.

Treatment with topical corticosteroid preparations was prescribed. The steroids most commonly used were triamcinolone acetonide (Kenacort[®], ointment or cream), fluocinolone acetonide (Synalar[®] ointment or cream), betamethasone-17-valerate (Celestona Valerat[®] ointment or cream) and hydrocortisone (Ficortril[®] and Sterosan-Hydrocortison[®] ointments).

30 patients, 21 women and 9 men, were placed on the sick list owing to the findings made at the examination. Of these, 21 had allergic contact dermatitis, 5 traumatic contact dermatitis, 2 nummular eczema, 1 atopic dermatitis and 1 had an unclassified dermatitis.

When further treatment was considered necessary, the patients were referred to their own physician or to the Department of Dermatology, Lund: 337 (41 %) of the 827 patients with hand eczema were referred to physicians in their home communities and 110 (13 %) to out-patient service at the Department of Dermatology in Lund. In addition, 86 patients (10 %) with hand eczema were referred to the section for occupational diseases, Department of Dermatology, Lund.

AFTER-EXAMINATION

The persons above the age of 16 who at the first examination had hand eczema and who had been tested were invited to take part in the after-examination at the Department of Dermatology 6–22 months after the first examination. Also the after-examination was free of charge for the patients. The after-examination was carried out from October 1965 to March 1966. The invitation to the after-examination was accompanied by a questionnaire concerning the course of the patient's skin disease after the first examination at the department. Those patients who did not respond to the invitation were re-invited, twice, if necessary. Those patients who did not respond to the third invitation were requested to give the reason why, and to return the questionnaire.

Response rate and reasons for not attending

669 persons, 214 men and 455 women, were invited to take part in the after-examination. 501 (75 %), 164 men (77 %) and 337 women (74 %) attended. The response rate was the same in all the age groups. The response rate did not vary with the time the patients had had their disease. The response rate of persons living near Lund (less than 25 km) did not differ from that of those living further away (more than 25 km).

The number invited and the number who responded and were after-examined are classified according to the diagnoses in Table 27. The response rate of the patients with different types of diagnoses was: allergic contact dermatitis 77 %, traumiterative contact dermatitis 72 %, atopic dermatitis 71 %, nummular eczema 89 % and unclassified dermatitis 78 %.

Out of the 501 persons who were after-examined, 73 (15 %) had atopic dermatitis or a definite history of previous dermatitis.

The questionnaire sent to the patients together with the invitation contained the following question: "Do you think that your hand eczema has become worse or better since the first examination at the Department of Dermatology in Lund?" They were questioned concerning any medical consultation, sick-leave, local treatment and any change of occupation since the first examination. They were also questioned as to what extent they had succeeded in avoiding products containing allergens considered as eczematogenous at the first examination. The purpose of the questionnaire was to enable a comparison

Table 27. *Response rate of persons with different sorts of eczema*

	invited	responded	
		number	%
allergic contact dermatitis	255	196	77
traumiterative contact dermatitis	294	212	72
atopic dermatitis	38	27	71
nummular eczema	19	17	89
unclassified dermatitis	63	49	78

Table 28. *Reasons for not attending the after-examination*

	number of persons
skin changes completely healed	42
insignificant symptoms	36
treated by other doctor	9
lack of time owing to work or household duties	40
difficulty to travel (because of disease, for example)	5
other and two or more of the above reasons	17
total	149

between those patients who attended the after-examination and those who only answered the questionnaire by post. All 501 examined filled in this questionnaire. Of the 168 persons who did not attend the after-examination, 149 filled in and returned the questionnaire. Of the 669 persons who were invited to after-examination, information was thus obtained on the course of the disease in 650 cases (97 %). From the 149 persons who were not after-examined, several reasons for their absence were given according to the questionnaire. The reasons are listed in Table 28. From the table it is evident that minor symptoms or absence of symptoms were the cause of not attending for 78 persons.

Clinical course and state of hand eczema

Table 29 gives the opinions the after-examined patients had of the course of the skin disease as well as data of the patients who were not after-examined but only filled in and returned the questionnaire. The proportion of *completely healed* in the group that was not after-examined was significantly larger than the proportion of *completely healed* in the after-examined group ($\chi^2 = 27.5$; $df = 2$; $P < 0.001$).

Table 29. *Course of hand eczema in 501 persons who took part in the after-examination and 149 who did not*

	after-examined %	not after-examined %
completely healed	10	28
improved	56	47
unchanged	30	24
worse	4	2

Table 30. *Change in the state of hand eczemas between the first examination and the after-examination (%)*

	allergic contact dermatitis	traum- iterative contact dermatitis	atopic dermatitis	nummular eczema	unclassified dermatitis	total
completely healed	22	29	19	29	29	26
improved	49	44	44	47	49	47
unchanged	22	21	33	24	14	21
worse	7	6	4	—	8	6

All data hereinafter given refer to patients who were after-examined.

The local treatment prescribed at the first examination was still being used by 59 % at the time of the after-examination. The skin symptoms had caused 24 % to consult a physician after the first examination. 25 persons had had sick-leave because of their hand dermatitis after the first examination. 25 persons reported that they had changed or modified their work because of their eczema during the time between the two examinations. In addition, 46 persons had changed their work for other reasons.

At the first examination all patients who had allergic reactions that were considered to be of clinical significance were informed of such reactions and advised to avoid products containing the allergens. At the after-examination 13 % thought that they had been able to avoid the allergens in question completely, 67 % said that they had reduced exposure to the allergens and 20 % reported that they had not been able to reduce such exposure.

The findings of the hands at the after-examination were compared with those recorded at the first examination. The differences between the findings in different types of eczemas on the two occasions are given in Table 30. At the after-examination the hand eczema had healed completely in 26 % (128 persons). Only 52 persons had, however, themselves reported complete healing. The patient's history of the hand symptoms may be regarded as a definition of the patient's *functional status*. Dysfunction of the skin is apparent from the history that the skin does not tolerate "physiological" injury and from informa-

Table 31. *Morphological state of skin in patients with skin disease of varying duration*

duration of disease at first examination months	number	completely healed at after-examination (%)
1-6	52	46
7-24	98	32
25-96	181	20
> 96	166	22

Table 32. *Condition of skin of persons who continued with the same occupation and of those who changed occupation*

condition of skin	same occupation	changed occupation because of	
		eczema	other causes
completely healed	110	8	10
improved	198	14	22
unchanged	97	—	10
worse	25	3	4

tion that therapeutic measures must be taken if the skin is to function satisfactorily. A skin that reacts with irritation on "normal" injury or that requires continuous or intermittent therapy is not functionally healed. The *morphological status* was, as expected, a less sensitive mirror of the health of the skin of the patient. The skin may be functionally inferior even though the eczema seems to be healed. In eczemas morphological healing precedes functional healing. The possibility that some patients might have exaggerated the symptoms must, however, also be considered. There was no significant difference between the various eczema groups regarding improvement.

Table 31 gives a comparison between the percentages of complete recoveries, judged from the status at the examination, in groups of patients who had had the disease for different length of time before the first examination. Those who had had the disease the shortest time were more often completely healed at the after-examination.

22 of the 25 persons who had changed their occupation because of eczema were improved (Table 32). The rate of improvement did not differ significantly between those who had changed their occupations and those who had not.

Testing

All patients were offered testing at the after-examination. 406 persons were tested, 129 men and 277 women. As at the first examination Al-test and Leuko-

plast® were used. At the first examination 11 % reported before the test that they were sensitive to adhesive and therefore Dermicel® was used. On the second occasion Dermicel® was also used for all patients who had reacted to Leukoplast® at the first examination and for those who had had positive reaction to balsams or colophony tests. Patients reacting to these compounds are known easily to develop intolerance to the adhesives. All together Dermicel® was used in 25 % of the re-tested patients. The application time, the reading time and the criteria for positive test reactions were the same as for the first testing.

All 406 persons tested at the second examination were tested with the following substances: methyl methacrylate 0.5 % in ethanol, dioctyl-p-phenylenediamine (DOPD) 2.5 and 1.5 % in MEK, isopropylphenyl-p-phenylenediamine (IPPD) 2.5 and 1.5 % in MEK, white pepper oil "Culinar" in 5 % ethanol, all spice oil "Culinar" 5 % in ethanol, carrots 50 % in petrolatum, parsnips 50 % in petrolatum, celery 50 % in petrolatum, and ether extract of *Primula obconica*. In addition testing was done with other substances which were suspected as the causes of eczema according to what was found from history and examination.

Positive reactions were recorded to the following substances (figures in brackets give the number of reactions): allspice oil (19), IPPD (18), jacaranda (7), extract of chrysanthemum (6), DOPD (4), white pepper oil (3), oil of cloves (1), methyl methacrylate (1), tulip (1), parsnips (1), *Primula obconica* (47). Of the patients with positive test reactions to extract of primula, 35 had been tested at the first examination. Test reactions to *Primula obconica* will be the subject of a special paper (Agrup, Fregert and Rorsman, *in press*).

Re-testing was performed in 379 persons out of the 406 persons tested at the second examination. These 379 persons, 118 men and 261 women, had been identically tested at the first examination with 11 substances. As to the substances, concentrations and vehicles, see Table 3, page 14. The sites on the back for the patch tests differed for two substances, formaldehyde and cobalt, at the first and second examinations. Thus both these tests were placed higher up on the back at the second examination.

80 persons were tested on the first occasion with 2 patches of each of the following substances: chromium, nickel, balsam of Peru, p-phenylenediamine and formaldehyde and 42 with 2 patches of cobalt. 184 persons were tested intracutaneously with chromium, nickel and cobalt on the first occasion. See page 16.

Table 33 gives the number of persons in whom the results of testing of 11 substances changed between the first and the second test.

In 213 patients (56 %) all the tests remained negative, in 68 (18 %) all positive reactions remained positive, in 73 (19 %) some tests turned positive,

Table 33. *Number of subjects with persistence and change of test reactions at second test occasion*

	number of subjects
unchanged positive	68
unchanged negative	213
additional positive	79 ¹
disappeared positive	25 ¹

¹ In 6 subjects the appearance of new positive reactions was accompanied by the disappearance of previously positive reactions.

in 19 (5 %) some turned negative and in 6 (2 %) of the patients one or more of the tests had become positive and one or more negative. The number of persons in whom at least one of the tests had become positive on the second occasion was 79 (21 %).

No difference was found between the proportion of men and the proportion of women who had become allergic to new substances. Of the 79 persons 52 were women and 27 were men.

Occurrence of new allergic reactions increased with age ($0.01 > P > 0.001$; χ^2 -test for trend). The duration of the eczema did not influence the tendency towards new allergic reactions to appear. New allergic reactions occurred to the same extent in persons re-tested within one year (51 %) as in persons re-tested more than one year (49 %) after the first test ($\chi^2 = 1.33$; $df = 1$; $P > 0.05$).

54 of the 79 patients who had acquired allergy to a new compound had one or several positive test-reactions at the first examination. Of all the re-tested persons, 204 had previous positive test reactions. Thus, persons with positive test reactions at the first examination had new positive reactions at the second examination to a greater extent than those who were negative at the first testing ($\chi^2 = 8.48$; $df = 1$; $P < 0.01$).

Atopic dermatitis or a definite history of previous atopic dermatitis was present in 58 of the re-tested patients and in 14 of the 79 patients who had acquired a new sensitivity according to the second testing, *i.e.*, no significant difference.

Flare-up reactions after the first testing were spontaneously reported by 9 of the 79 persons with additional positive reactions at the second testing. The 9 persons had all together 12 flare-up reactions and they were ascribed to p-aminoazobenzene (5), p-phenylenediamine (4), cobalt (1), cinnamon (1) and diaminodiphenylmethane (1).

Table 34 shows the changes of the test reactions to single substances between the first and the second occasion. Of all the tests with the 11 substances, 3.9 % were positive on the first and second occasion, 92.7 % were negative on both

Table 34. *Persistence and change of test reactions*

substance	unchanged		changed to	
	pos.	neg.	pos.	neg.
potassium bichromate	21	350	8	0
cobalt chloride	23	337	17	2
nickel sulfate	35	341	2	1
balsam of Peru	22	343	7	7
p-phenylenediamine	6	352	16	5
p-aminoazobenzene	7	335	35	2
epoxy resins	6	370	1	2
formaldehyde	18	351	3	7
diethylstilbestrol	3	374	2	0
cinnamon	6	367	3	3
diaminodiphenylmethane	17	345	14	3
total	164	3865	108	32
%	3.9	92.7	2.6	0.8

occasions, 2.6 % turned positive on the second occasion and 0.8 % turned negative. A test for binomial distribution was used on the hypothesis that the expected number of tests converted from positive to negative was equal to that of those converted from negative to positive. The difference between the frequency of the tests that turned positive and of those that turned negative was, however, statistically significant for p-aminoazobenzene and cobalt ($P < 0.001$), for chromium and diaminodiphenylmethane ($P < 0.01$) and for p-phenylenediamine ($P < 0.05$) but not for the other substances tested. No significant difference between men and women was found concerning sensitization to any single substance.

For p-aminoazobenzene the number of positive reactions on the second occasion was substantially higher than that found on the first occasion. For p-phenylenediamine the frequency of sensitization was higher than the number of allergic reactions originally found, and for diaminodiphenylmethane and cobalt the number had increased almost 2-fold on the second occasion. For chromium the number of positive reactions was also considerably larger on the second occasion. Double patch tests or simultaneous patch and intracutaneous tests at the first examination were not followed by sensitization more often than was a single patch test.

Out of 17 patients who had become allergic to cobalt after the first examination, 5 women were allergic to nickel already at the first examination and 6 men and 2 women were allergic to chromium at the first examination. None of the 8 patients who had developed a chromium allergy at the second examination had any allergy to nickel or cobalt at the first examination.

Out of 16 persons who had become allergic to p-phenylenediamine, one had already at the first examination a positive reaction to p-aminoazobenzene, 13

Table 35. *Test reactions at first testing in patients with new positive reactions at second testing*

substance	neg.	erythema	primary toxic
potassium bichromate	8	0	0
cobalt chloride	14	3	0
nickel sulfate	2	0	0
balsam of Peru	6	1	0
p-phenylenediamine	16	0	0
p-aminoazobenzene	33	2	0
epoxy resins	1	0	0
formaldehyde	3	0	0
diethylstilbestrol	2	0	0
cinnamon	3	0	0
diaminodiphenylmethane	12	1	1

became simultaneously allergic to p-aminoazobenzene and 2 to diaminodiphenylmethane. 5 of the 14 patients who became allergic to diaminodiphenylmethane became allergic also to p-phenylenediamine (2) and p-aminoazobenzene (4).

It might be questioned whether the large number of positive tests at the after-examination might be explained by the assumption that positive reactions on the first occasion had been judged as erythema reactions and primary irritant reactions. Table 35 shows that this was not the case. The low frequency of erythema and primary irritant reaction on the first occasion shows that the high frequency of new reaction on the second occasion cannot be explained by changes in the evaluation of the test reaction.

At the re-examination it was found that in 20 % of those persons who became sensitized between the first and second tests the hand dermatitis had disappeared, in 52 % it had improved, in 20 % it was unchanged and in 8 % it had become worse. No difference was found in the course of the dermatitis in the 79 persons who had become sensitized and the remaining 300.

14 patients had a definite exposure to substances to which they were found to have become allergic at the second examination. Of these 14 patients the eczema of the hand had disappeared in 2, was improved in 6, remained unchanged in 3 and had become worse in 2. The substances to which these patients reacted and to which they were exposed before as well as after the first examination were: chromium (1), cobalt (4), nickel (1), p-phenylenediamine (1), p-aminoazobenzene (2), formaldehyde (1) and diaminodiphenylmethane (5). One of the 2 persons sensitized to nickel developed a classical nickel dermatitis after the first testing.

A conversion of a positive test reaction at the first examination to a negative one at the second occurred in 25 persons. All together 32 tests became negative. Conversion from a positive to a negative reaction was noted for all substances except chromium and diethylstilbestrol. Balsam of Peru and formal-

dehyde were the substances for which positive tests most often turned negative. Of the 25 persons in whom some positive reactions turned negative 16 were tested with Dermicel® on the second occasion and 10 of these had on the first occasion been tested with Leucoplast®. In these 10 persons 12 tests positive on the first occasion were negative on the second. 6 of the 7 persons in whom a positive reaction to balsam of Peru turned negative were tested with Dermicel® on the second occasion, but with Leucoplast® on the first. 6 of the 7 persons who had lost their sensitivity to formaldehyde had at the first testing been tested with 3 % formaldehyde and with 2 % at the second testing. No difference was found between males and females regarding the relative number of tests that turned negative.

DISCUSSION

The main purpose of the investigation was to get a survey of hand dermatoses in the receiving area of the Department of Dermatology, University Hospital, Lund. In order to obtain more reliable information on the frequency of these diseases it was desirable not to base the estimation on an analysis of the clientèle of the department but, if possible, on a less selected material. The existing organization for general health surveys was considered useful for tracing and contacting persons with hand dermatoses. Thanks to the generous co-operation and support of the Central Committee of General Health Surveys in the county of Malmöhus, this idea could be realized.

In an investigation of the present type, the frequency of the various dermatoses will depend more on the chronicity of the lesions than on the intensity of the symptoms they produce, whereas the frequency of a given condition seen at an out-patient department depends mainly on the intensity of the symptoms it causes. Thus, the chronicity of senile lentigo and vitiligo explains the high frequency of these conditions in the present investigation, and the relatively low frequency of acute conditions, such as pyogenic infections. Acute eczema, which is often seen at out-patient departments, was uncommon in the present material. On the other hand, chronic eczema, which is a common diagnosis at the department, was also often encountered in this investigation.

The frequency distribution of diagnosed skin diseases varies with the availability and organization of medical facilities. Thus, acute dermatitis may be underrepresented at a department with a long waiting-list. At a department of dermatology co-operating closely with an allergologic unit of a department of internal diseases the frequency of atopic hand dermatitis will probably be high. In the present investigation such selection factors were avoided.

The rôle played by given etiological factors, will, of course, vary with the composition of the patient material. Thus, contact eczema is presumably more common in certain industrialized areas, and the frequency of allergic contact eczema will also vary with the type of industries in the region. In an agricultural area zoophilic mycoses may be common, while in a region with poor hygiene, scabies or bacterial infections will be more preponderant. It should thus be realized that although certain selection factors are avoided in an investigation of this type, the results obtained are valid only for the population and the time period studied, limitations emphasized by Bonnevie (1939).

Opinions differ on the relative significance of constitutional, infectious, toxic and allergic factors and climatic conditions in the causation of hand dermatoses (Lane, Rockwood, Sawyer and Blank 1945, Sulzberger and Baer 1949, Cormia 1952, Sutton and Ayres 1953, Gross, Blade, Chester and Sloane 1954, Ronchese 1955, Marcussen 1956, Ferguson and Rothman 1959, Gross 1959, Sullivan and Farber 1959, Krogh 1960, Flood 1963, Bettley 1964, Costello and Gibbs 1967, Blohm and Lodin 1968). One factor which must be considered when comparing the results obtained in different studies is the experience of the examiner and his ingrained attitude to dermatologic problems. At the department where the present investigation was carried out, considerable interest has been focused on contact allergy during the last decade.

The present investigation does not give prevalence figures, but it does allow a certain *estimation of the prevalence* of hand dermatoses. It should, however, be stressed that the material was to some extent selected. Thus, certain categories surely utilized the opportunity to a free medical examination less than others, and some age groups were clearly underrepresented. Hellgren (1967) assessed the frequency of skin diseases in persons who took part in general health surveys in Sweden. He also examined persons who did not take part in such surveys and found the dermatoses to be at least equally common in these persons.

In this study *hand dermatoses* were reported in 2.3 % of the questionnaires. If the group examined had been really representative of the population studied, the prevalence of hand dermatoses except warts would be 2.2 % because at the examination hand dermatoses were found in 94 % of those who had reported such lesions. But this figure would be too low, because many persons with various skin changes on the hands had denied such lesions in the questionnaires. On the basis of the observations made in the field study the prevalence of hand dermatoses can be estimated to be about 4 %.

As for *palmar naevi*, direct comparison with earlier prevalence studies is possible because in the field study 1212 persons were examined especially for such naevi. Palmar naevi were found in 67 (5.5 %) of these persons, *i.e.*, a figure agreeing well with figures given for white persons by Cullen (1962) and by Allyn, Kopf, Kahn and Witten (1963). The frequency of naevi cannot be assessed from questionnaires because the persons in question have often not noticed the pigmentations of the skin or do not regard them as pathological changes.

If we disregard the fact that the present material was not really unselected, it is possible, with certain reasonable assumptions, to calculate the approximate prevalence of individual skin diseases of the hands. Thus, if it be assumed that the 24 % who did not take part in the investigation had dermatoses with the same frequency as the participants, and that those who reported in the questionnaire that they had skin changes but were not examined had hand dermatoses of the same types as the group examined, the values found should be corrected with a factor of 1.5 since 34 % of those answering in the affirmative were not examined.

On the basis of these assumptions the prevalence of *hand psoriasis* was 0.2 %. For comparison it might be mentioned that Lomholt (1963) in a census study on the Faroe Islands found a prevalence of hand psoriasis of 0.2 %. In a Swedish study Hellgren (1967) found the prevalence of psoriasis of the hands to be 0.04 %. The prevalence calculated on the basis of the present investigation is in good agreement with that given by Lomholt for the Faroe Islands. The prevalence is, however, much higher than that given by Hellgren for Sweden. This may be because the present investigation was focused especially on the hands, with the result that even less obvious psoriatic changes were recorded.

With the assumption used in the calculation of the prevalence of psoriasis the prevalence of hand eczema can also be calculated. The prevalence of *hand eczema* would then be 1.2 %, the figures for allergic contact and traumiterative dermatitis being 0.4 % and 0.5 %, respectively. But it is possible that among those who reported in the questionnaire that they had eczema, the condition occurred more often in those examined. On the other hand, in the field survey it was found that only half of those in whom eczema was found had given an affirmative answer in the questionnaire. Thus, the prevalence might be almost twice as high as that calculated.

827 persons, 552 females and 275 males, had *hand eczema*, i.e., twice as many females as males. In the two largest groups, allergic contact dermatitis and traumiterative contact dermatitis, the ratio females to males was 2.3:1 and 3.2:1, respectively. This explains the overall predominance of females in this study, in which there were all together 884 females and 667 males. The relative number of hand eczema in patients examined for hand dermatoses was significantly higher for women than for men. A predominance of hand dermatitis in women was also observed in the out-patient service of our department. In 1965 there were 259 males and 415 females, who attended the department for the first time because of hand dermatitis. The ratio of females to males was 1.4:1 for allergic contact dermatitis and 2.2:1 for traumiterative contact dermatitis at the department. This female predominance is well known from earlier studies (Lane *et al.* 1945) and has recently been described in a Swedish material (Bleeker 1967).

At the time of the examination the *mean age* of patients with allergic contact dermatitis was 45 years compared with 39 years for those with traumiterative dermatitis. The mean age at onset was also higher for allergic than for traumiterative contact dermatitis, *viz.* 37 and 33 years, respectively. The mean duration of allergic contact dermatitis was 8 years; that of traumiterative contact dermatitis, 6 years. It seems probable that some patients had originally had traumiterative dermatitis which had later developed into allergic contact dermatitis.

Most patients with hand eczema had consulted a doctor before the present investigation, especially those with atopic dermatitis and allergic contact dermatitis. The higher percentage of persons who had sought medical advice be-

cause of atopic dermatitis might be explained by the long duration and the intensity of the disease. The fact that the persons with allergic contact eczema had sought medical advice more often than those with traumatic contact dermatitis can partly be explained by the difference in the duration of the diseases. It also seems possible that the subjective symptoms might be more severe in persons with allergic contact dermatitis than in those with traumatic contact dermatitis. The percentage of persons receiving treatment at the time of the present investigation because of atopic dermatitis and allergic contact dermatitis was also higher than in the other groups.

Persons with allergic contact dermatitis sought advice earlier than those with traumatic contact dermatitis. This may be explained by the greater severity of symptoms of allergic contact dermatitis where the onset is often acute, while that of traumatic dermatitis is insidious.

Allergic contact dermatitis was a more common cause of *sick-leave* than traumatic contact dermatitis. Also this appears to reflect the greater severity of symptoms of allergic dermatitis. On analysing the reasons for sick-leave of persons with allergic and traumatic contact dermatitis it must, however, also be observed that many of those with traumatic contact dermatitis were housewives. It is difficult for housewives to get household help and, as a rule, the sick allowance from the insurance company is small. This may explain the relatively small number of sick days for the persons with traumatic dermatitis.

Positive test reactions were seen to a large extent among patients with hand eczema. The high frequency of positive tests among patients with allergic contact eczema was expected but there was a considerable number of positive test reactions also among other eczema groups. This is in agreement with the original findings by Jaeger (1923) and with later dermatological experience (Rostenberg and Sulzberger 1937, Skog and Thyresson 1953, Rajka 1961, 1967, Modée and Skog 1962). Positive tests often enable an establishment of a diagnosis of allergic contact dermatitis, since it happens that the patient cannot contribute with an explanatory history until he has been closely questioned after an allergic test reaction to a specific substance has been established (Bettley 1964, Agrup, Dahlqvist, Fregert and Rorsman *in press*). Our results do not agree with those of Bonnevie (1939) who got negative test reactions in 300 "control cases", most of them with different types of eczema.

A fairly high frequency of allergic test reactions also among persons with diagnoses other than allergic contact dermatitis is not astonishing because increased absorption of allergens and concomitant sensitization must be an effect of the impairment of the barrier in patients with eczema. In some of these cases the allergens may be contributory causes of eczema though inquiry into the history revealed no definite exposures.

The frequency of positive reactions to the substances tested agree well with those previously reported from this department (Fregert 1962). The differences found may be explained by differences in the composition of the clinical

series as well as by differences in the composition of the test substances, the concentrations used and the solvents. The results also agree well with those reported by the Scandinavian Committee for Standardization of Routine Patch Testing (Magnusson *et al.* 1966, 1968). Here, too, the differences found could be ascribed to differences between the materials studied.

In the present study there was a significantly higher frequency of allergic reactions in women than in men. With regard to the particular compounds, however, the female preponderance was significant only for cobalt and nickel. For cobalt there was an interesting difference between males and females in the number of positive tests. Thus, only 1.6 % of males tested reacted positively compared with 8.9 % of the females. A comparison of the frequency of allergy to cobalt can be made with a recent investigation on patients in Lund (Fregert and Rorsman 1966), in which it was shown that 4.2 % of the males tested and 4.8 % of the females reacted positively to cobalt. In the present study men exposed to cobalt in cement were perhaps examined at an earlier stage of their disease than in the study of Fregert and Rorsman. The high frequency of allergy to cobalt in women with hand eczema may have something to do with the frequently unavoidable exposure of the affected hand to metals. The study of Fregert and Rorsman was not limited to patients with hand eczema. A lower frequency of sensitization to cobalt in women with "nickel dermatitis" elsewhere on the body may be explained by the fact that contact with metal in those patients is avoided as soon as allergy to nickel has developed and before allergy to cobalt may have become strong enough to be detectable. Other still obscure contacts with cobalt, affecting particularly the hands of women may, of course, also be a contributory cause of the observed higher frequency of allergy to cobalt observed in women with hand dermatitis.

Of the patients with hand eczema, a total of 85 persons (43 males and 42 females) had existing *atopic dermatitis*, while another 81 persons (23 males and 58 females) had atopic dermatitis in their history. Thus atopic dermatitis occurred or had occurred in 19 % of patients with hand eczema.

It is obvious that the distinction between traumiterative dermatitis in persons with atopic dermatitis and atopic dermatitis of the hands, aggravated by traumatization must be arbitrary. In the present investigation atopic dermatitis was diagnosed only if the appearance of the dermatitis was characteristic.

The atopic constitution of the skin may be of importance for the development of contact dermatitis (Hill and Sulzberger 1935, Carr, Berke and Becker 1964, Fisher 1967, Glickman and Silvers 1967, Rajka 1967, Hjorth and Fregert 1968). Of patients with the diagnosis of traumiterative contact dermatitis, 16 % had a history of atopic dermatitis. In patients with allergic contact dermatitis the corresponding figure was 6 %. The findings in the present investigation indicate a relationship between atopic dermatitis and traumiterative dermatitis but the data do not allow any statement on the importance of atopic constitution for the development of allergic contact dermatitis.

Positive patch test reactions were not uncommon in persons with atopic dermatitis in the present material. Varying figures for the frequency of positive patch test reactions for patients with atopic dermatitis are on record (Rostenberg and Sulzberger 1937, Skog and Thyresson 1953, Calnan 1956, Rajka 1961, 1967, Epstein and Mohajerin 1964, Epstein 1965, Skog 1965). Differences may partly be due to different interpretation of primary irritant test reactions. But medication and testing with sensitizing topical components like neomycin may increase the number of allergic reactors. Since the frequency of positive allergic patch test reactions increases with age it is also evident that the representativity of different age groups in studies on patients with atopic dermatitis may be of importance for the occurrence of positive test reactions. Rajka (1961) has reported that the number of clinically significant patch test reactions is low in atopic dermatitis.

Occupational dermatoses were diagnosed in 246 persons, i.e., 16 % of the persons examined. In addition, 288, i.e., 19 % of the examined persons had hand dermatoses caused by their own household work. Occupational dermatoses have been reported to constitute 10–70 % of all occupational diseases in different materials (Schwartz, Tulipan and Birmingham 1939, Buckup 1953, Occupational Dermatitis in California 1958, Occupational Disease in California 1961, 1963, Blejer-Prieto 1964, Schulz 1967, Hjorth and Fregert 1968, National Program for Dermatology 1968, Laubstein and Mönnich 1968).

On comparing the frequency of occupational dermatoses as diagnosed in this study with official Swedish statistics (Yrkesskador 1964 and 1965) it was found that most cases are not reported. This is also evident from other Swedish studies on occupational dermatoses (Thyresson and Skog 1954, Wahlberg 1968, Bolinder, Magnusson and Nyrén 1969). In the present material occupational dermatoses were more common among women than among men, if housewives' dermatoses were included. This is in agreement with the findings by Thyresson and Skog (1953), who found 223 women among 350 patients with occupational dermatoses. They analysed 1379 patients with sick-leave because of skin diseases and found that 25 % of these diseases were occupational. Household work was considered the cause of 124 of 350 cases of occupational dermatoses. If housewives' dermatoses are excluded in the present series there was a certain male preponderance which also is generally reported in statistics on occupational dermatoses (Yrkesskador 1965, Schwartz, Tulipan and Birmingham 1939, Laubstein and Mönnich 1968). A male preponderance was very pronounced among 68 patients that were granted annuities by Industrial Injuries Insurance because of dermatitis (Skog and Tottie 1961). Of these 64 were males. However, it has also been reported that rates of occupational dermatoses were slightly higher for women than for men (Braun and Sitgreaves 1958).

Housewives' dermatosis was a considerable problem in the ages between 20 and 50, while occupational dermatoses increased in frequency up to the age of 60. Skog (1959) also found that the ages between 20 and 50 showed the

highest frequency of housewives' dermatitis, but Blohm and Lodin (1968) found a pronounced frequency peak of housewives' eczema at the age of 20, after which it decreased rapidly.

Of persons with occupational dermatosis, 34 % had been granted sick-leave because of the dermatosis, compared with 19 % of those with housewives' dermatosis. The frequency of sick-leave for persons with other hand dermatoses was 11 % and occupational and housewives' dermatoses were thus responsible for most of the sick-leave because of hand dermatoses. Contact dermatitis was the disease most commonly causing sick-leave among occupational and housewives' dermatoses.

The occupational dermatoses covered a wide variety of occupations. The distribution closely resembled that reported in another Swedish material by Thyresson and Skog (1953). Dermatoses due to agricultural work, which were common in the present investigation covering an area with a large agricultural district, were, however, rare in Skog and Thyresson's study. In their study dermatoses due to medical work were common, but not in the present investigation. This may be explained by the fact that the town of Lund, which has a large university hospital, and many other medical centres, was not included in this investigation. This illustrates how the frequency of occupational dermatoses depends on the pattern of occupations in the area studied.

In all compilations of dermatoses in different occupations contact dermatitis occupies a prominent position and several compilations on contact dermatitis of various occupations and their exposures to particular allergens are available (Schwartz, Tulipan and Birmingham 1939, Buckup 1953, Skog and Thyresson 1953, Thyresson and Skog 1953, Pirilä and Kilpiö 1954, Klauder 1962, Meneghini, Rantuccio and Riboldi 1963, Blejer-Prieto 1964, Wagner and Bredahl 1965, Hodgson 1966, Rajka 1966, Birmingham 1968, Laubstein and Mönnich 1968, Wahlberg 1968). Contact dermatitis was also predominant in the present investigation. Allergic contact dermatitis was more common than the traumatic type among our patients with occupational dermatitis. In many other studies, however, traumatic dermatitis has been shown to be more common than allergic dermatitis (Weinberger 1950, Birmingham 1957, Klauder 1956, 1962, Blejer-Prieto 1964). In housewives' eczema traumatic dermatitis was found to be more common than allergic dermatitis, which was also reported by Skog (1959). The preponderance of traumatic dermatitis in housewives explains the overall preponderance of this diagnosis in this study. It has previously been described that traumatic contact dermatitis occurs more frequently in women than in men (Thyresson and Skog 1953, Skog 1959).

The 10 standard substances which most often showed *allergic reactions* in persons with *occupational dermatitis* were, in descending order of frequency: chromium, nickel, cobalt, diaminodiphenylmethane, formaldehyde, wood tars, phenol formaldehyde resin, balsams of pine and spruce, cinnamon and balsam of Peru. The corresponding list for *housewives' eczema* was: nickel, cobalt, balsam of Peru, balsams of pine and spruce, chromium, phenol formaldehyde

resin, colophony, mercaptobenzothiazole, formaldehyde and wood tars. Besides the standard substances, reactions were common to plants and hand lotions in persons with housewives' eczema.

Thyresson and Skog (1953) in their study on patients with occupational dermatitis found the commonest allergens to be turpentine, chromium, nickel, formaldehyde, p-phenylenediamine and mercury. Turpentine was not considered satisfactorily standardized in this study and comparison with Thyresson and Skog's results can therefore not be performed. p-Phenylenediamine which occupied the fifth place in Thyresson and Skog's list did not belong to the 10 commonest allergens in patients with occupational and housewives' dermatitis.

In the present study the following positive reactions to standard tests were often found to be correlated to occupational exposures: chromium, nickel, cobalt, diaminodiphenylmethane and formaldehyde. Correlation between positive test and household exposure was found especially for nickel, cobalt, chromium, colophony and mercaptobenzothiazole, and hand lotions and hand creams. Thyresson and Skog (1953) found that positive reactions to turpentine, chromium, nickel, and p-phenylenediamine were often of aetiologic significance, but this was less often the case with formaldehyde and mercury. In an investigation of housewives' eczema in 182 persons Skog (1959) found the following allergens to be most common: nickel, hand lotions, turpentine, formaldehyde, chromium and p-phenylenediamine. Skog's work and the present investigation thus argue for the significance of nickel, chromium and hand lotions and creams. The present investigation also demonstrated the significance of contact with plants, colophony and rubber. The importance of contact with rubber as a cause of housewives' eczema has been pointed out also in a recent investigation at the Karolinska hospital (Blohm and Lodin 1968). Contact with plants is a common cause of hand eczema (Rook 1961, Rook and Wilson 1965, Hjorth 1966) and positive test reactions to different plants proved to be correlated to housewives' eczema also in this study. Skog (1959) underlines the significance of formaldehyde and p-phenylenediamine contacts for housewives' eczema, but in the present investigation these substances were rarely judged as responsible. Rothenborg and Hjorth (1968) have drawn attention to the occurrence of perfume allergy in contact dermatitis and also demonstrated that many persons with perfume allergy react to wood tar and balsam of Peru. It seems possible that allergy to these substances may be clinically more important than what was suggested by this study.

Frequent and prolonged wet work was the most common irritant exposure in housewives' eczema. The importance of soaps and synthetic detergents for housewives' eczema is a subject of continued discussion. The investigations by Suskind *et al.* (1963) have shown that the skin can tolerate detergents well if they are used in recommended concentrations. It should, however, be emphasized that detergents are often used in higher concentrations than those recommended by the manufacturers (Blohm and Lodin 1968, Hjorth and Fregert 1968). Besides, traumatization in association with soaps and detergents may

cause eczema even if either factor alone can be tolerated. Occlusion and maceration under working gloves can impair the skin, also if allergy to gloves is not present. 59 % of the patients with housewives' eczema were found to use rubber gloves and 7 % used plastic gloves in the present study. Traumatization by finger-rings, primary irritating copper salt from the gold rings, primary irritating substances caught under the rings are common irritating factors which can cause traumiterative eczema (Gaul 1958, Ferguson and Rothman 1959). In the present investigation traumiterative housewives' eczema started under the rings in 36 % of the cases. Allergic housewives' eczema started under the rings in 17 %. Skog (1959) and Blohm and Lodin (1968) found that 19 % and 25 %, respectively, of housewives' eczema started under the wedding rings.

Persons with atopic skin are exposed to a great risk of developing housewives' and occupational dermatitis (Glickman and Silvers 1967, Rajka 1967). In this study 4 patients with occupational dermatitis had a diagnosis of atopic dermatitis. Of the persons with housewives' eczema, 8 had a diagnosis of atopic dermatitis. The significance of atopic skin constitution is, however, further illustrated by the fact that 21 of the patients with occupational dermatitis, *i.e.*, 12 %, and 29 of the patients with housewives' eczema, *i.e.*, 11 %, had a history of atopic dermatitis in childhood. Patients in whom the hand eczema was believed to be mainly due to contact with allergen or a primary irritant were placed under the heading allergic or traumiterative contact dermatitis, irrespective of a history of atopic dermatitis.

The *after-examination* showed that, though most of the patients improved, symptoms often remained. According to the patients' history the state of their skin was improved in two thirds and remained unchanged or became worse in the remaining third. 10 % considered that the changes had disappeared altogether and 4 % that the lesions had become worse. But the results seemed to be somewhat better among those who did not attend the after-examination. In evaluating the result of the treatment it must be considered that most of the patients had had the condition for a long time before the first examination. The results were more favourable in the patients with a short history of hand dermatitis.

At the after-examination a special attention was paid to the *persistence and change of test reactions*. The investigation showed that 32 positive tests at the first testing had turned negative at the second testing. This conversion might be partly explained by the more frequent use of a less occlusive adhesive patch on the second occasion. This seems to be the explanation for the disappearance of reactions to balsam of Peru. In 6 of the 7 cases that became negative to formaldehyde, the concentration used on the first occasion was 3 % compared with 2 % on the second, which might be a reason for the different test results. In some cases, however, the degree of allergy may have decreased and avoidance of substances demonstrated as allergens at the first testing may have been

of importance. Allergies can disappear despite natural exposure to the allergen (Miescher 1938, Morgan 1953, Nielsen and Bang 1954, Fisher and Shapiro 1956, Fisher, Pelzig and Kanof 1958, Marcussen 1959, Rhodes and Warner 1966). Experimentally induced allergy tends to disappear with time if exposure to the allergen is avoided (Wedroff and Dolgoff 1935, White and Baer 1950).

The investigation showed that allergy had often developed between the first and the second examinations, which has been reported in a preliminary communication (Agrup 1968). Various possible causes of this increase must be considered. The difference in the reactions could not be explained by any change of the testing technique. A certain change of test site for cobalt and formaldehyde should be of minor significance (Magnusson and Hersle 1965).

The second series of tests was performed between October and March, while the first series was carried out also in April, May, June and September. But there appears to be no evidence of such seasonal differences being able to explain the higher frequency of positive tests in the second series (*cf.* Björnberg 1968).

The occurrence of new allergic reactions increased with age. The tests that had become positive on the second occasion might have been due to exposure of the person to the allergen at his place of work or in the environment where he spent his leisure hours during the interval between the first and the second testing. But the interval between the testings was short compared with the duration of life before the first testing. One might imagine that the exposure to the allergen during active eczema might have a much stronger effect than otherwise because of the more massive absorption through the injured skin. But the number of tests that were negative on the first occasion and positive on the second was not found to vary with the duration of the eczema.

It is known that patients with active eczema, even if localized only to the hands may at testing show an increased irritability to some toxic agents (Björnberg 1968). The frequent improvement of the patients skin condition between the first and the second testing should, however, exclude the possibility of a generally increased reaction tendency as a cause of the conversion of previously negative tests.

Thus sensitization induced by the first testing seems to be the most natural explanation of new positive test reactions at the second testing.

The risk of sensitization by the patch test is considered to be small (Miescher 1938, Bonnevie 1939, Sulzberger 1940). For such sensitizers as dinitrochlorbenzene, poison ivy, primula, methyl salicylate, nitrosodimethylaniline, phthalic anhydride and picryl chloride the risk of sensitization by patch testing, as judged from a flare-up at the site of application, is, however, well known (Sulzberger 1940). According to Bonnevie (1939), a number of contact allergens can cause a flare-up and sensitization often follows tests with paraamidophenol and primula. Fregert and Rorsman (1964) reported that 2 out of 10 patients tested with phenyl glycidyl ether became sensitized to this epoxy compound. Skog (1965) studied flare-up reactions to tests with p-phenylenediamine.

Hjorth (1966) and Hjorth and Thomsen (1966) elucidated the problem in tests with two other common contact allergens, *Primula obconica* and neomycin. Calnan (1967) has drawn attention to the risk of patch test sensitization and reports flare-up reactions to a variety of substances used in routine testing. The incidence of sensitization, as assessed solely on the occurrence of a flare-up reaction, is certainly lower than the true incidence (Agrup, Fregert and Rorsman *in press*). Harber, Targovnik and Baer (1967) state that photo patch tests with halogenated salicylanilides might cause allergic sensitization and recently Epstein (1968) demonstrated by re-testing that 2 of 3 volunteers became sensitized after a first photo patch test with chlorpromazine.

No investigation comparable with that presented here is available. Nielsen and Bang (1954) reported positive test reactions in patients in whom the reactions had been negative 15-19 years previously. But the length of the interval between the two test occasions precludes drawing any conclusions about the risk of sensitization by the patch test. The sensitizing effect of a single test with common allergens has been studied by Kligman (1966). None of the 200 persons examined by him with 10 test substances became sensitized. Although the subjects, the test substances, the test techniques and the test intervals in Kligman's investigation differed from those in the present study the differences between the results obtained are still difficult to explain.

Some tests may imply such a massive exposure to the allergens as to induce allergy in persons previously not hypersensitive at all. The risk of making a person allergic to a substance is great when the dose used is large, compared with that to which the person may be exposed during his everyday life. The possibility of an increase of sensitivity of the individuals tested must be borne in mind regardless of whether they react positively or negatively in standard method. Allergic contact sensitivity is not an all-or-nothing process, but occurs in all degrees of intensity (Lowney 1968). It seems possible that any patch test can contribute to an increase of the degree of sensitivity. Such an increase need not be reflected by a conversion of a negative test reaction to a positive one.

Sensitization to substances with amino-groups in para-position was common in the present investigation. Cross reaction between p-aminoazobenzene and p-phenylenediamine may have occurred. It is also possible that a metabolite common to both substances may have been formed and constituted the sensitizing substance (Mayer 1949, Baer 1954). Sensitization to cobalt was noticed, above all, in persons who on the first occasion were allergic to nickel or chromium. Since exposure to these 2 substances often implies exposure also to cobalt, it would appear likely that the sensitized persons were also "presensitized" to cobalt. The effect of pre-exposure on sensitization by testing has been discussed by Hjorth (1966).

In this connection it should be remembered that even detectable sensitization may be clinically insignificant, *e.g.* if the allergy induced is weak or if the patient is only slightly exposed to the allergen (Kligman 1958, Vandenberg and Epstein 1963). It has been claimed that sensitization by testing is of little prac-

tical clinical importance since the patients who are able to become sensitized by patch tests must also easily become sensitized by contact under other conditions (Bonnievie 1939, Sulzberger 1940, Hjorth 1963). Skog (1965) felt that such sensitization by patch testing is probably not of serious importance since he did not observe clinical dermatitis due to test sensitization. Calnan (1967), however, has reported contact dermatitis due to exposure to allergens to which the patients had become sensitized by patch testing. In the present study one of two patients who had become sensitized to nickel reported definite nickel dermatitis occurring for the first time after the first testing. Single observations of this type do not warrant any conclusion as to the clinical significance of patch test sensitization. But in view of the large number of patients who failed to make a complete recovery from their hand eczema one might wonder whether testing had increased their degree of sensitivity and thereby contributed to impairment of healing.

Patch testing is one of the most commonly used diagnostic methods in dermatology. In a recent review on testing, Kligman (1966) asked: Have the tests been tested? The question cannot be answered unconditionally in the affirmative. It is evident that we lack fundamental information on the risks involved by patch testing. A further evaluation of the significance and hazards of this diagnostic method is therefore necessary.

SUMMARY

The purpose of the present investigation was to get a survey of hand dermatoses, especially hand eczema, in south Sweden. From January 1964 to June 1965 all together 107,206 persons above 10 years of age and taking part in a general health survey in *Malmöhus läns landsting* (the county of Malmöhus, Malmö excluded) were asked whether they had any skin changes other than common warts on their hands: 2499 (2.3 %) reported in the affirmative and were offered free examination of their hand dermatoses, which was accepted by 1659 (1.5 %).

The frequencies of the 10 commonest dermatoses were: hand eczema (827), senile lentigo (141), psoriasis (124), vitiligo (72), acrovesiculatio recidivans (51), circumscribed palmar keratoderma (33), palmoplantar pustulosis (27), dermatophytosis (23), deep fissures (16) and mycids (14).

The frequencies of the different types of hand eczema were: allergic contact dermatitis (286), traumiterative contact dermatitis (335), atopic dermatitis (85), nummular eczema (22) and unclassified dermatitis (99).

Of the persons examined with epicutaneous tests, positive reactions to one or more allergens were observed in 93 % of those with allergic contact dermatitis, in 25 % of those with traumiterative contact dermatitis, in 35 % of those with atopic dermatitis, in 41 % of those with nummular eczema, and in 27 % of those with unclassified dermatitis.

The 10 routinely used allergens that most often produced positive reactions were: balsam of Peru, nickel, cobalt, formaldehyde, chromium, balsam of pine and spruce, diaminodiphenylmethane, wood tars, phenol formaldehyde resin and cinnamon.

The substances most often producing positive test reactions and most often traced as eczematogenous were: nickel, cobalt, chromium, diaminodiphenylmethane, formaldehyde, cinnamon, balsam of Peru, mercaptobenzothiazole, colophony and thiuramdisulfides.

246 persons were found to have an occupational dermatosis: 39 % of them had allergic contact dermatitis and 31 % traumiterative contact dermatitis. 288 persons had housewives' dermatosis: 36 % had allergic contact dermatitis and 58 % traumiterative contact dermatitis. The high frequency of traumiterative dermatitis in housewives is responsible for the high frequency of this disease in the material as a whole.

Existing or previous atopic dermatitis was noted in 19 % of the persons with hand eczema.

501 persons above 16 years of age who had hand eczema and who had been tested were re-examined 6–22 months later. Of the re-examined patients 10 % reported that the eczema had disappeared, 56 % that it had improved, 30 % that it was unchanged and 4 % that it had become worse.

At the after-examination 379 patients were re-tested with 11 substances to which they had been tested at the first examination. In 213 patients (56 %) all the tests remained negative, in 68 (18 %) all positive reactions remained positive, in 73 (19 %) some tests turned positive, in 19 (5 %) some turned negative and in 6 (2 %) of the patients one or more of the tests had become positive and one or more negative. On the first occasion 196 tests were positive, and 164 of them remained so on the second occasion. In addition, 108 tests negative on the first occasion were positive on the second. The high number of new positive test reactions seems mainly to be due to test sensitization. The demonstrated high incidence of sensitization by patch testing necessitates re-evaluation of this procedure.

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